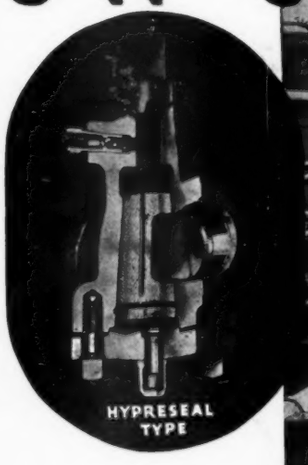
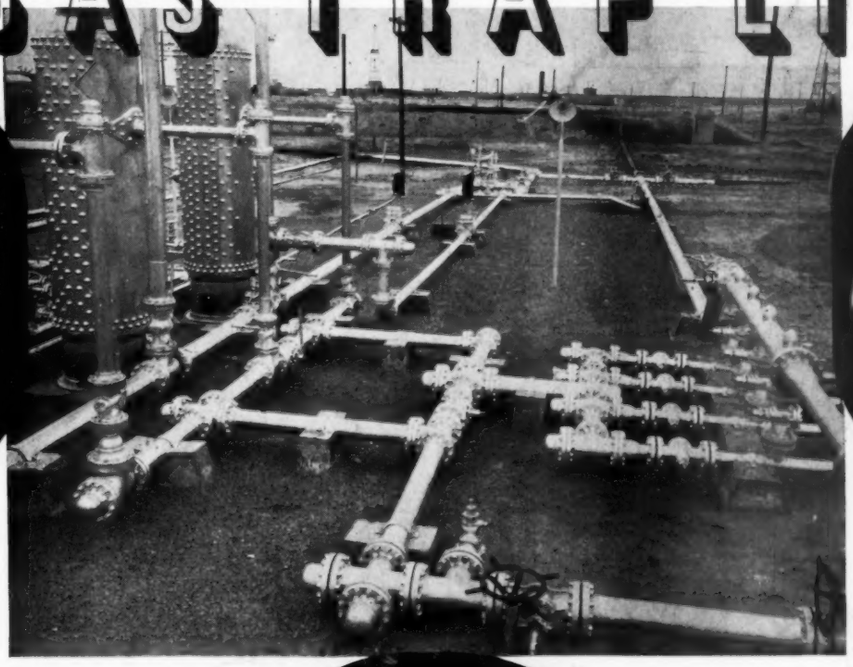
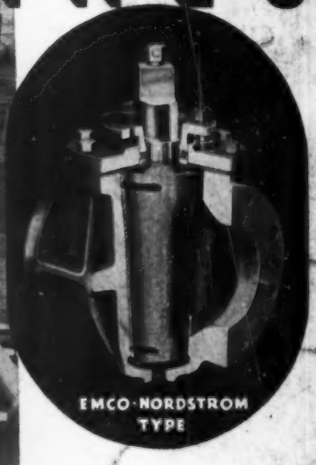
NORDSTROM VALVES ON GAS TRAP LINES

LUBRICATED PLUG

PATENTED "SEALDPORT" LUBRICATION







PREVENT LEAKAGE INTERNALLY AND EXTERNALLY

•

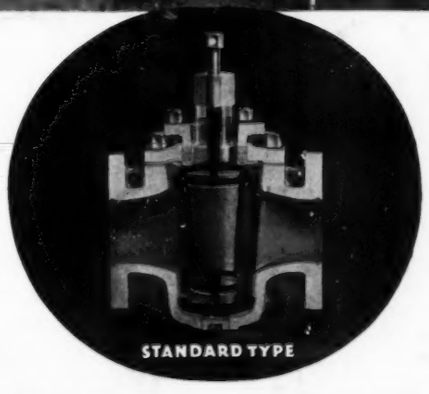
EASIEST TO TURN

•

POSITIVE CLOSURE

•

PRESSURE TESTED UP TO 6000 LBS. ACCORDING TO TYPE SELECTED



FOR ALL SERVICES IN DRILLING, PRODUCTION, TRANSMISSION AND DISTRIBUTION

•

MERCO-NORDSTROM VALVE CO.
a subsidiary of
Pittsburgh Equitable Meter Co.
Main Offices: Pittsburgh, Penna.

Branch Offices: New York City, Buffalo, Philadelphia, Columbia, Memphis, Atlanta, Chicago, Kansas City, Tulsa, Houston, Los Angeles and Oakland

ONLY NORDSTROMS CAN MEET EVERY MAJOR VALVE NEED

INSTITUTION OF PROGRESS

Constant, thorough research and analysis in the most modern of laboratories over a period of many years has developed Tretolite formulas to be the rapid, dependable and economical method for the treatment of crude oil and B. S. to pipe line requirements. Tretolite Advisory Service is maintained to render helpful advice on treating problems. It is yours for the asking.

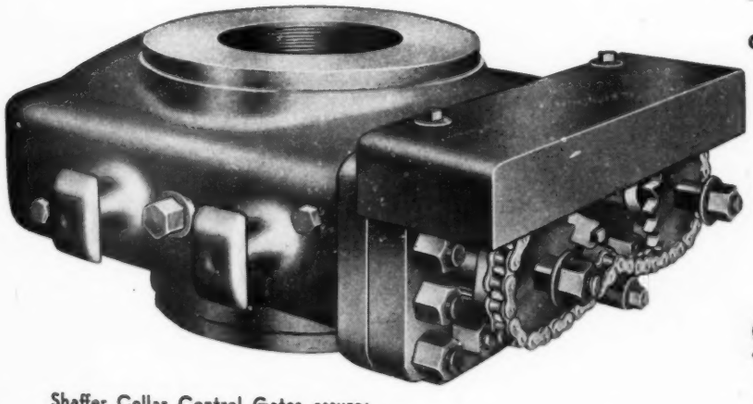
TRETOLITE COMPANY

MANUFACTURING CHEMISTS

DALLAS **ST. LOUIS** LOS ANGELES

Representatives in all Principal Fields

The time to protect your men and your investment is before a disastrous blowout. Play safe —use Shaffer Cellar Control Gates. They will positively close and hold under any condition encountered in modern drilling and successfully hold high pressures indefinitely after being closed on the well. The upper gate provides protection when the drill pipe is in the hole and the lower gate gives a complete shut-off when the pipe is out of the hole. The use of two Shaffer Cellar Control Gates not only prevents blowouts, but keeps the well under positive control at all times. The Remote Control feature of the Shaffer Cellar Control Gates provides simple and efficient means for both mechanical and manual closing from outside of the derrick.



Shaffer Cellar Control Gates assure: MAXIMUM SAFETY . . LONG LIFE . . LOW UPKEEP. TRY THEM AND BE CONVINCED.

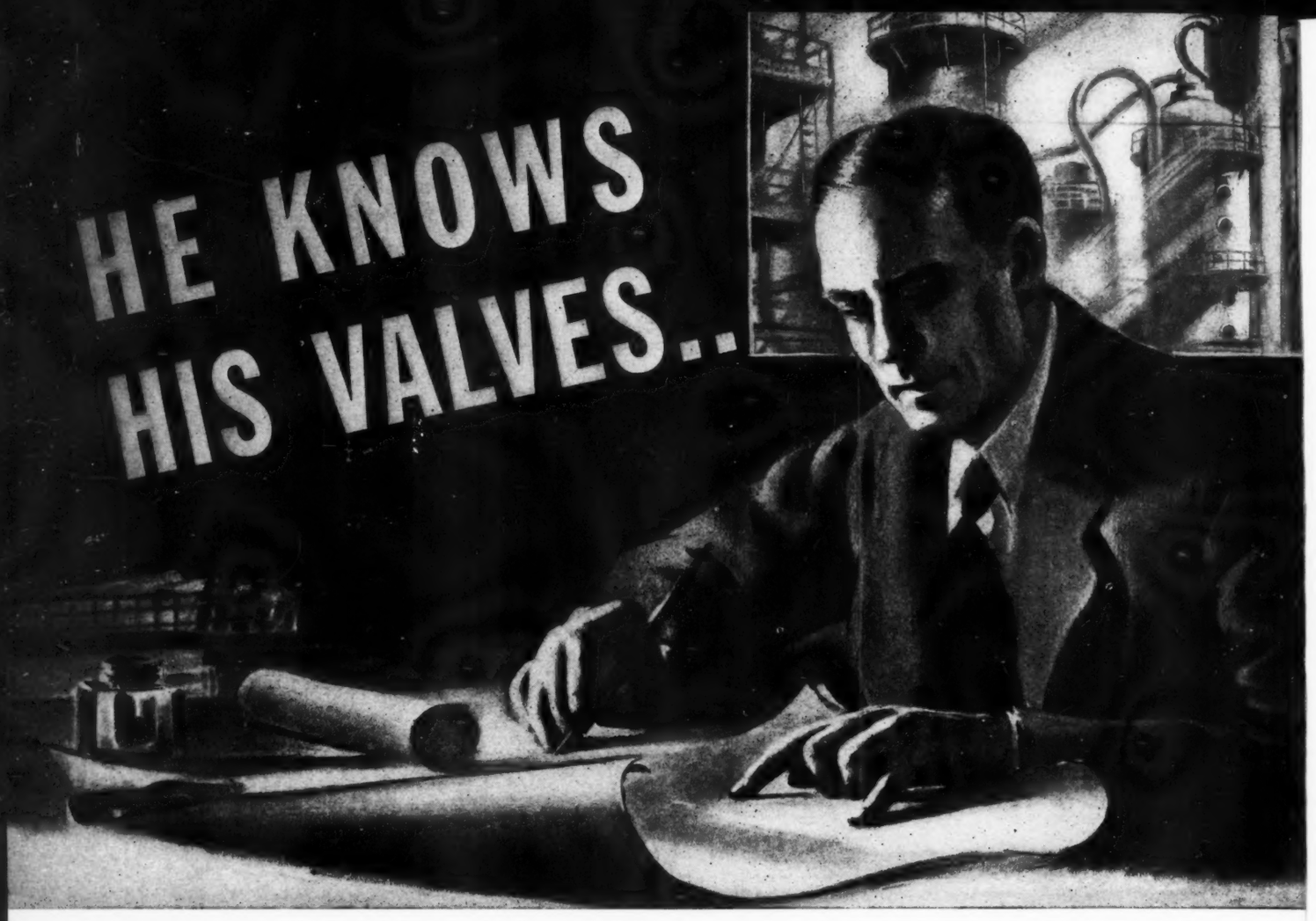
Specialists in High Pressure Drilling and Control Equipment

SHAFFER TOOL WORKS

BREA, CALIFORNIA • HOUSTON, TEXAS

OKLAHOMA CITY, OKLAHOMA

EXPORT OIL WELL SUPPLY COMPANY

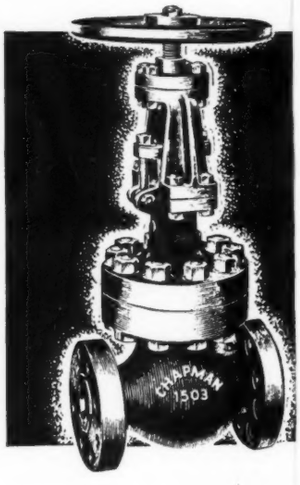


and his requisitions read "Chapman"

The chief here picks equipment the same way he picks men—on the strength of past working records. And throughout his operations he has Chapman Valves for "traffic managers" in control of flow.

Engineers all over the world know that every Chapman Valve requisitioned is a SEASONED VETERAN in its job—that it will never freeze or quit—because hundreds of others just like it are giving year after year of stout service. And they know that Chapman specifications are written out of hard-earned field experience — because Chapman engineers come to them PERSONALLY, to check and test all valve development work.

Every requirement is covered by the complete Chapman line. Gate, globe and check valves, with fittings, in all sizes. For pressures from 150 to 1500 lb. Temperatures from 50 below to 1000 above. Stocks are complete, deliveries prompt. Just get in touch with the nearest office—Atlanta, Boston, Chicago, Cleveland, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, Salt Lake City, San Francisco, Syracuse, Tulsa.

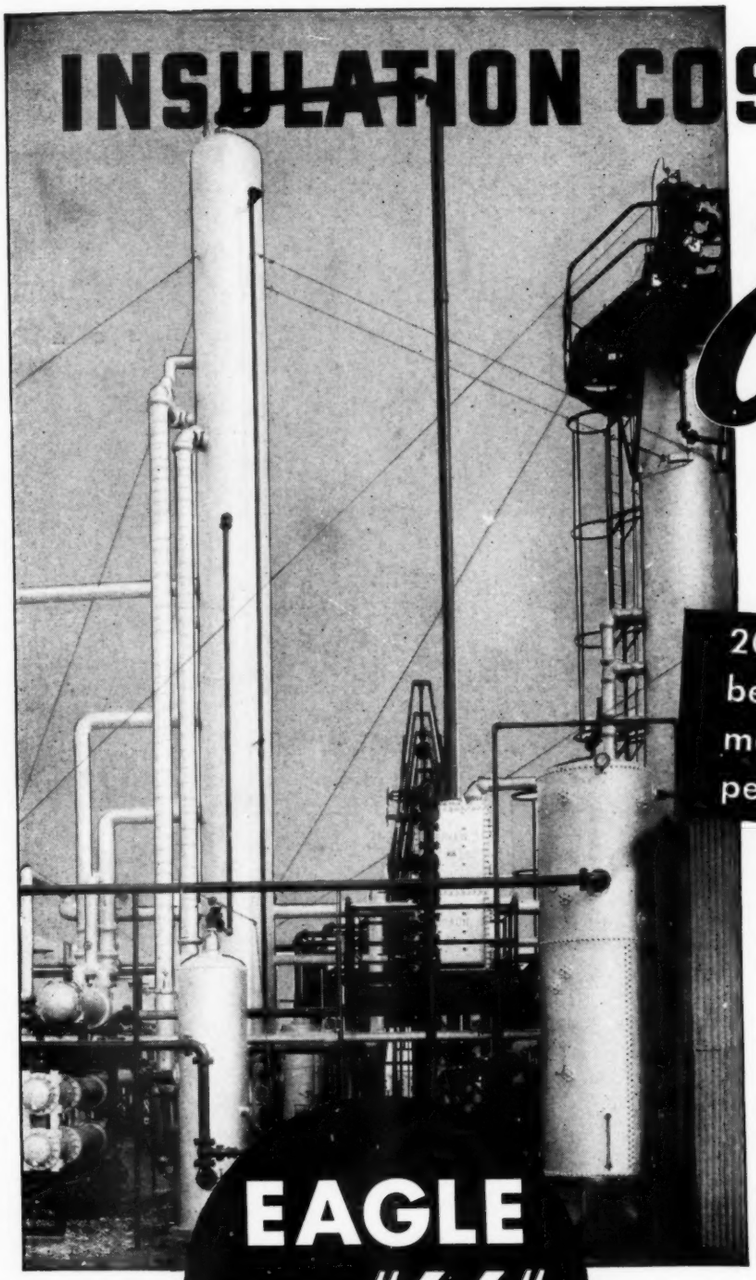


The CHAPMAN VALVE MANUFACTURING COMPANY

INDIAN ORCHARD, MASSACHUSETTS

INSULATION COSTS CUT BY Eagle super "66"

... improved plastic insulation



20% greater coverage . . can be mixed and applied immediately . . efficient for temperatures as high as 1800° F.

● "A perfect all-purpose insulation for refinery use!" That's what engineers said of Eagle "66".

Now this efficient plastic insulation has been made even easier to apply . . . gives even greater coverage. The result is Eagle Super "66".

This *improved* insulation costs no more than Eagle "66". Mix it with water and it's ready to trowel on at once. Shrinkage has been greatly reduced. Sticks like glue on hot surfaces. Efficient for temperatures as high as 1800° F.

Mail coupon today for complete specifications and free sample.

EAGLE SUPER "66" PLASTIC INSULATION

A complete line of insulating materials for refineries including

Eagle "BX" Insulating Brick. An extremely strong, light weight insulating brick. Easy to cut. Resists spalling. For temperatures up to 2500° F.

Eagle Blanket Insulation. Insulating wool felted and secured. For boilers, breeching, furnaces.

Eagle Stalistic (boiler setting cement). Tough, rubbery plastic—eliminates air infiltration through masonry, boiler, furnace walls.

Eagle Insulseal (waterproofing cement. Durable coating protects all heat insulation against deterioration.

Eagle Fireproofing Concrete. High grade insulating concrete that furnishes dependable fireproof protection to structural members.

Eagle "Verox" Insulating Brick. A light weight, efficient insulating brick for backing up refractory walls or roofs. For temperatures up to 2000° F.

Eagle Asbestos Lumber. Structurally strong. Fireproof. Resists heat and weather.

Eagle "77" Pipe Covering. Insulating wool felted and secured. Flexible and easily applied. Particularly adapted for hot lines where cement finish is desired.

Special Contracting Service
Eagle-Picher Contracting Division will work directly with your engineers to help solve any insulation problem—from selecting the right materials to supervising the entire installation. Call in Eagle-Picher on your next job.

The Eagle-Picher Lead Company,
Dept. PE8, Cincinnati, Ohio • Please send me, free, your illustrated booklet, "Efficient Heat Insulation". Also sample of Eagle Super "66".

Name_____

Address_____

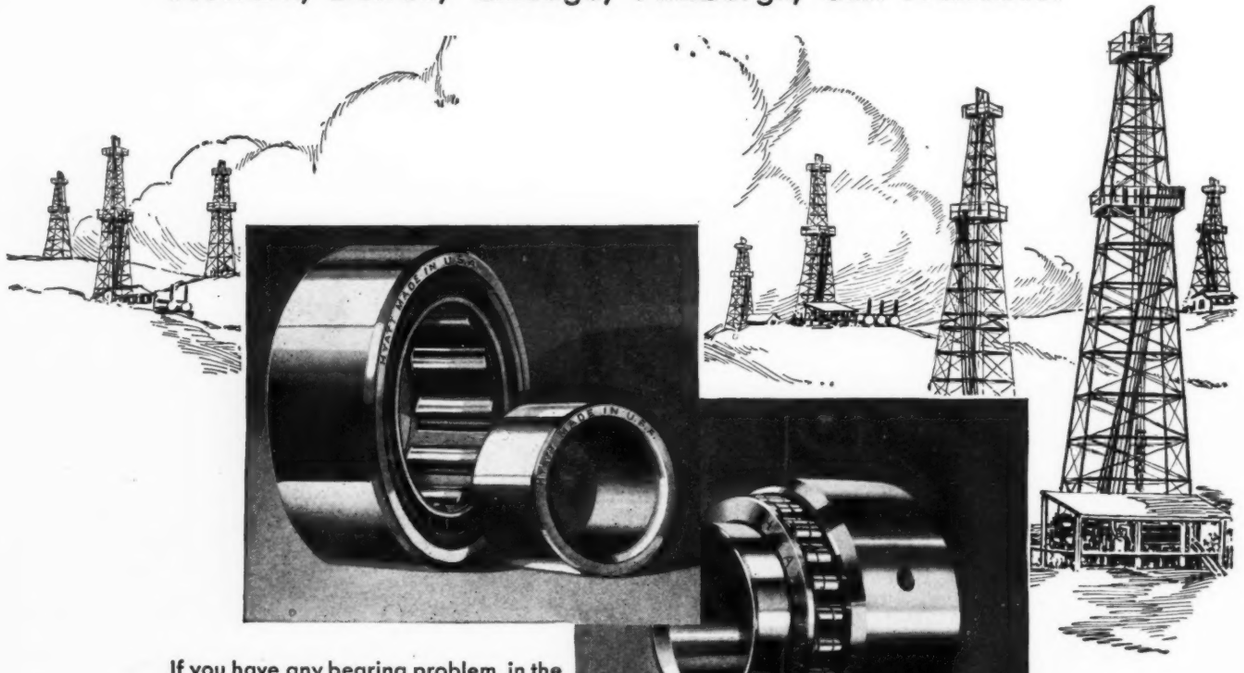
City_____ State_____

The Petroleum Engineer, issued thirteen times a year by the Petroleum Engineer Publishing Co., 404-407 Tower Petroleum Bldg., Dallas, Texas. Subscription price, $2.00 per year, two years $3.00—25 cents a copy. Entered as second-class mail matter May 1, 1932, at the post office at Dallas, Texas, under the Act of March 3, 1879.

When extra *Load Capacity* counts....

count on HYATT!

Unseen, unheeded, these high-capacity bearings handle their appointed tasks silently, smoothly, efficiently. Years of hard service in all types of equipment, under all kinds of conditions, do not lessen their original accuracy, strength, or performance. Hyatt Roller Bearing Co., Newark, Detroit, Chicago, Pittsburgh, San Francisco.

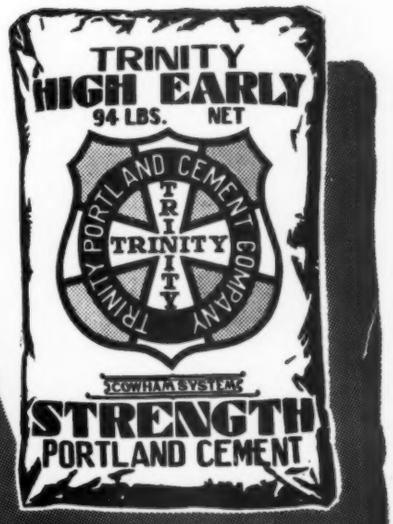


If you have any bearing problem, in the machines you manufacture or in your own operating equipment, Hyatt plant and field forces are at your disposal.

Saves time!

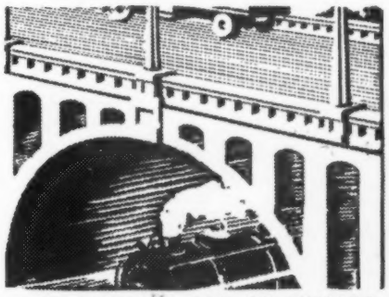
USE TRINITY "HIGH EARLY" IN OIL WELL CEMENTING AND IN ALL CONCRETE CONSTRUCTION WHERE SAVING OF TIME IS A VITAL FACTOR

Saves money!



BUILDINGS READY FOR OCCUPANCY WEEKS SOONER

SPEEDS HIGHWAY WORK AND SAVES COSTLY DETOURS



FOR BRIDGES, BRIDGE PILINGS AND GRADE SEPARATIONS

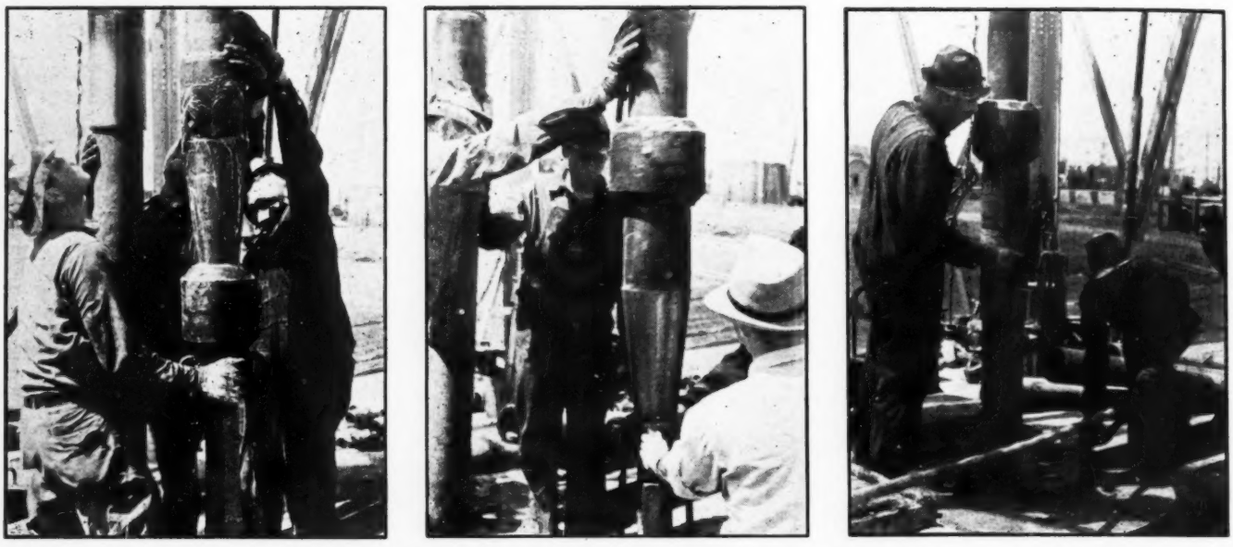
Trinity "HIGH EARLY STRENGTH" Portland Cement is a TRUE Portland Cement—guaranteed to meet and exceed the tentative standard specifications for High Early Strength Portland Cement of the American Society for Testing Materials, Designation C 74-30 T.

Use Trinity "HIGH EARLY STRENGTH" Portland Cement for your oil well cementing and plug backs, and for any concrete construction where saving of time is important. Three conveniently located plants assure prompt delivery. Call our nearest office. We will be glad to consult with you on your concrete problems.

TRINITY PORTLAND CEMENT COMPANY

Manufacturers of Trinity Standard Portland Cement, Trinity "HIGH EARLY STRENGTH" Portland Cement and Trinity Mix Masonry Cement.

DALLAS • FORT WORTH • HOUSTON



Installing Patterson-Ballagh Stabilizers in Oklahoma City Field

A $360.00* Casing Insurance Policy will give you:

1 Protection against whipped-off or collapsed casing that might save you upwards of $2500.00 on a single job.

2 Protection against loss of production caused by fishing jobs that might cost thousands of dollars. (Example: A loss of one week's protection in the Rodessa field would amount to approximately $1900.00).

3 Protection against loss of time caused by fishing jobs. (It is estimated that the value of lost time to oil company and contractor for a single well in the Oklahoma field amounts to approximately $200.00 per day).

4 Protection against premature failure of the well because of worn casing. (Competent engineers state that the ultimate life of a well may be reduced as much as five years on account of worn casing).

This Policy Costs You Nothing Because the Added Life of the Drill Pipe More Than Offsets the Cost of Patterson-Ballagh Protectors.

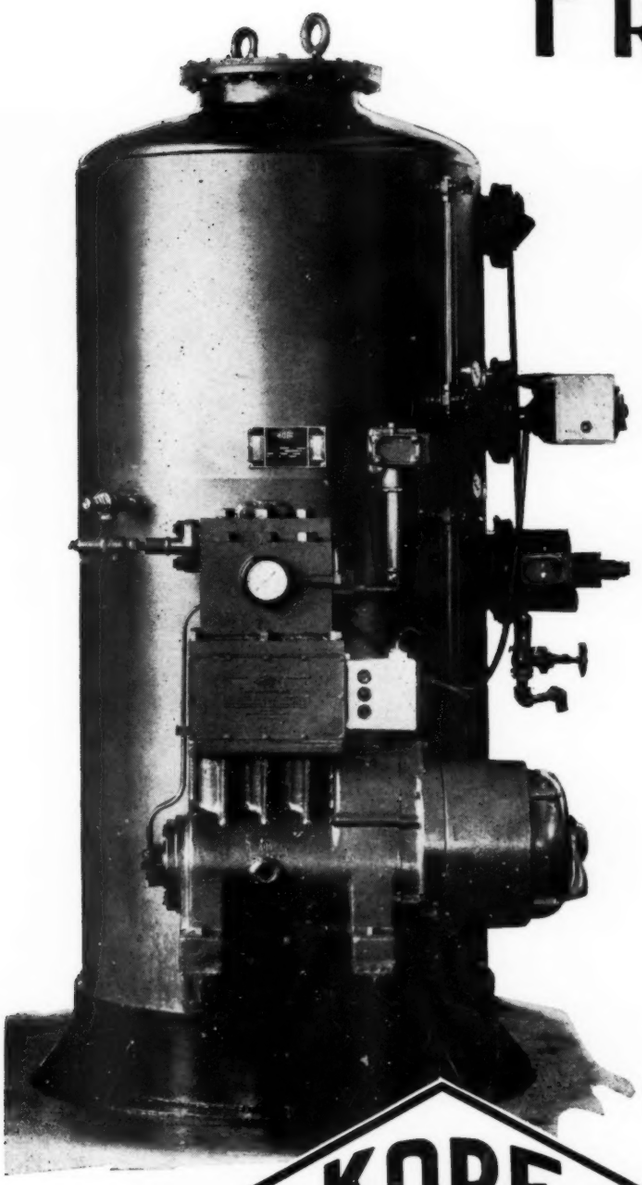
PATTERSON-BALLAGH PROTECTORS

*This is average cost of protecting casing in the Rodessa field. In Oklahoma City the cost would be approximately $280.00. This cost is greatly reduced in proportion to the number of wells later drilled with the same protected drill pipe.

PATTERSON-BALLAGH CORPORATION

PLANT AND GENERAL OFFICES: 1900 East Sixty-fifth Street, Los Angeles, California, U. S. A. • New York Office: 39 Cortlandt Street Oklahoma Office: Oklahoma City, 1704 N. W. 17th Street • Texas Office: Houston, 515 M. & M. Building • California Warehouse Stocks: Los Angeles • Kettleman Hills • Bakersfield • Ventura

PRODUCTION *Control*



The Kobe hydraulic method of pumping provides oil producers with certain definite advantages as a result of the close control of fluid levels and production.

Initial production capacity of the Kobe Pump is obtained by the selection of a specific plunger size. Variations over the complete range from 0% to 100% capacity are accomplished by automatically intermitting the operation of the triplex which supplies power fluid to the Production Unit submerged in the well. In central plant operation, metering valves automatically control the operating speed of each Production Unit independently, and can be adjusted to give any desired rate of flow. All these control adjustments can be made entirely automatic, and in response to changes in the fluid level of the well.

Kobe production control provides exclusive advantages which are readily apparent to producers. Complete data covering this important feature of the Kobe Pump will be supplied on request.

KOBE

KOBE *hydraulic* ALL PURPOSE **PUMP**

KOBE, INCORPORATED
(Pronounced KŌB)

Manufacturers of KOBE Heat-Treated Screen Casing and KOBE Pump
3040 East Slauson Ave., Huntington Park, California

FORT WORTH, because of its central location, is an important center in the oil industry, evidenced by the large number of major and independent companies and manufacturers maintaining their offices, plants and refineries here.

Fort Worth's banks, with ample resources and with practical experience in serving the Oil Industry, cordially invite you to discuss your requirements with them.

The FIRST NATIONAL BANK

The FORT WORTH NATIONAL BANK

CONTINENTAL NATIONAL BANK

VISIT THE
FORT WORTH
FRONTIER
CENTENNIAL

FULL RECOVERY *with* SPEED!

GUIBERSON "Type K" Swab

The GUIBERSON Type A three-cup swab and Type E two-cup swab are famous for their successful and economical swabbing of tubing and casing.

The GUIBERSON patented flexible-cup swab was the first swab and is still the *only* swab which utilizes the correct swabbing principle. In going in the hole the fluid compresses the flexible cup inward, thus insuring speed in lowering; in coming out the fluid weight expands the flexible cup to give perfect contact, thus insuring a full recovery.

GUIBERSON now offers a slight variation of the Type E—the Type K.

The GUIBERSON Type K swab combines speedier dropping with full load recovery. The valve on top, instead of on bottom, gives considerably less restricted by-pass area through the swab. This factor combined with the bullet nose has proved the Type K the fastest falling swab on the market.

The GUIBERSON Type K swab otherwise, in design and construction, is the same as the Type E. Cups are changed with ease and rapidity. The entire cup assembly slips off the solid mandrel upon removal of the bottom retaining nut. Type K cup assemblies, sleeves and thimbles are interchangeable with those of Type E.

Some GUIBERSON flexible-cup swab advantages found in Types A, E and K are: (1) *Raise full load*, because fluid holds cup surface tightly against casing and tubing; (2) *Pass pipe joints and projections uninjured* because of cup flexibility; (3) *Do not wear out casing or tubing*, because flexibility and construction of cups eliminate excessive friction; (4) *Run in faster without sticking* due to cup flexibility; (5) *Do not tear rubbers*, because of protective wire basket and durability of composition; (6) *Are more economical*, because of right swabbing principle, causing more trips with less swab rubbers.

For details refer to our section in the 1936 Composite Catalog, or see your supply house.

THE GUIBERSON CORPORATION

Box 1106, Dallas, Texas

TULSA: 502 Wright Bldg.; HOUSTON: 2241 Hermann Drive; WICHITA, KANSAS: 510 S. Fountain St.; NEWARK, OHIO: First and Locust Sts.; LOS ANGELES, CALIF.: W. R. Guiberson Co., 723 E. Gage Ave.; NEW YORK: 30 Rockefeller Plaza.

GUIBERSON "Type E" Swab

GUIBERSON "Type A" Swab

GUIBERSON

BETTER BE SAFE THAN SORRY

New... GRADE "T" SUCKER RODS
(FULLY HEAT TREATED)

FOR sulphide and corrosive wells having high stresses up to 40,000 pounds per square inch. Made of nickel alloy steel, S.A.E. 4615, fully heat-treated.

Only "OILWELL" Sucker Rods are quenched and drawn over their entire length.

OIL WELL SUPPLY COMPANY

Subsidiary of United States Steel Corporation

Branch Stores in All Oil Fields

SUCKER ROD ENGINEERING SERVICE

Often the same grade of sucker rods will not work efficiently in wells only 100 yards apart. Now "Oilwell's" metallurgically and mechanically trained Sucker Rod Engineers can analyze the many pumping problems and specify the grade of sucker rod you need. Call on them to help you get the greatest efficiency in your pumping.

"OILWELL"

REG. U. S. PAT. OFF.

The lugs on the Liner Setter Mandrel (a) fit into the "T-Slots" of the Liner Setter Adapter (b). A one-eighth turn to the right makes a positive connection which permits the liner to be raised, lowered or rotated, as conditions demand. The Adapter is connected directly to the slotted pipe when the liner is not to be packed off or suspended.

(Above, left): This is the simplest form of liner packer. The packing element is made a part of the Adapter assembly. It is expanded by rotating the top connection by means of the Setter connected to the drill pipe after the liner is set on bottom to secure a friction hold. This form is used when the liner is not to be suspended, but a secure, permanent seal between the top of the liner and the casing is required. (Above, right): The Plain Liner Hanger is used when solid support for the liner is required. The slips are positively released by partial rotation of the liner when the desired point is reached. If it is desired to pull the liner at a later time, the Liner Setter Mandrel is easily stabbed into the Adapter, and the slips released and locked by a slight turn of the drill pipe or tubing.

Extension Packer for cementing through perforations attaches to the lower end of the Liner Setter Mandrel and may be extended to any desired depth below top of liner. Packers are set to approximate I. D. of liner. Cementing pressure further expands packers, thus preventing cement from rising above them, and forces cement out through perforations at desired point.

BAASH-ROSS

LINER SETTERS AND LINER HANGERS ARE

S A F E !

Running and setting a liner, or pulling it from the well later on, is easy and SAFE when you use the Baash-Ross equipment shown on this page. The adapter with the ingenious "T-slots" forms the top connection of all types of Baash-Ross Liner Hangers, or is attached directly to the slotted pipe. The lugs on the simple, rugged, but efficient Liner Setter Mandrel fit into the "T-slots" of the Adapter easily, lock securely to insure maximum safety while running in and placing the liner, and permit all necessary rotation in either direction. After the liner is landed, the Liner Setter is released by a one-eighth turn. This same Liner Setter Mandrel is easily stabbed into the Adapter at any later time should it be necessary to remove the liner from the well.

Their safety and economy have made these Baash-Ross tools popular wherever liners are used. Specify the type that fits into the completion program for your next well.

The Baash-Ross Lead Seal Packing Liner Hanger supports the longest liners with maximum safety. It also provides a permanent, leak-proof seal between the top of the liner and the casing. The packing is squeezed into tight contact with the casing wall by means of the weight alone of the liner transmitted to the packing element through the liner hanger body. The lead packing cannot become vulcanized to the casing, and the liner may be pulled at any later time in the same manner as the plain type Liner Hanger.

Refer to our Section in your 1936 Composite Catalog for complete descriptions of these and other Baash-Ross safe, modern oil tools. The section begins on page 115.

BAASH-ROSS TOOL COMPANY

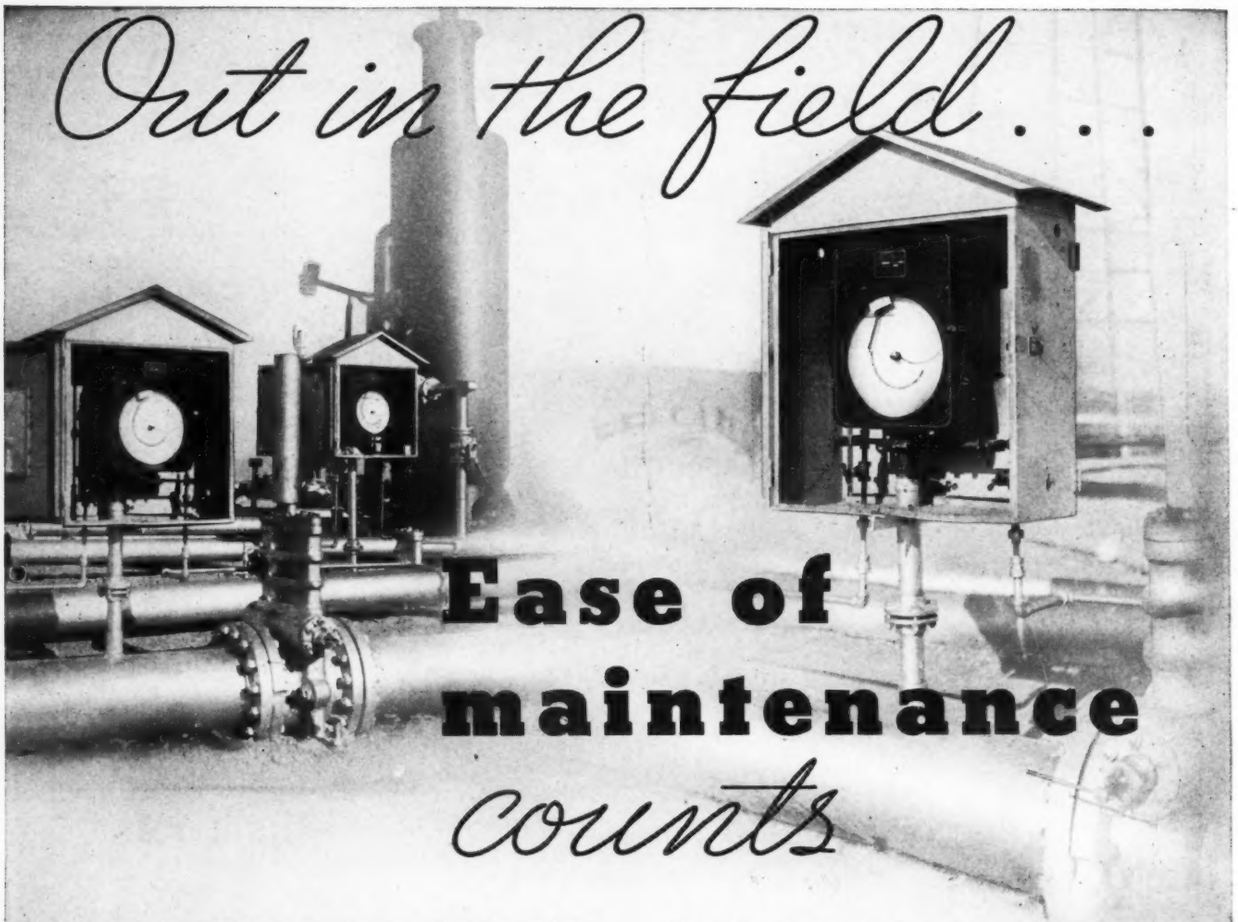
Telephone 3-4406
1559 S. E. 29th St.
OKLAHOMA CITY

Telephone Fairfax 9363
5300 Clinton Drive
HOUSTON

General Offices:
5512 Boyle Ave.
LOS ANGELES

Export Office:
30 Church St.
NEW YORK, N. Y., U. S. A.

Gulf Coast Distributors: NORVELL-WILDER SUPPLY CO.



Out in the field . . .

Ease of maintenance counts

Ask the practical field engineer what he thinks of any meter, and he will tell you in terms of how little attention it needs . . . how easy it is to keep in proper adjustment.

That's why you see so many more WESTCOTT orifice meters out in the field where there's no time for coddling instruments.

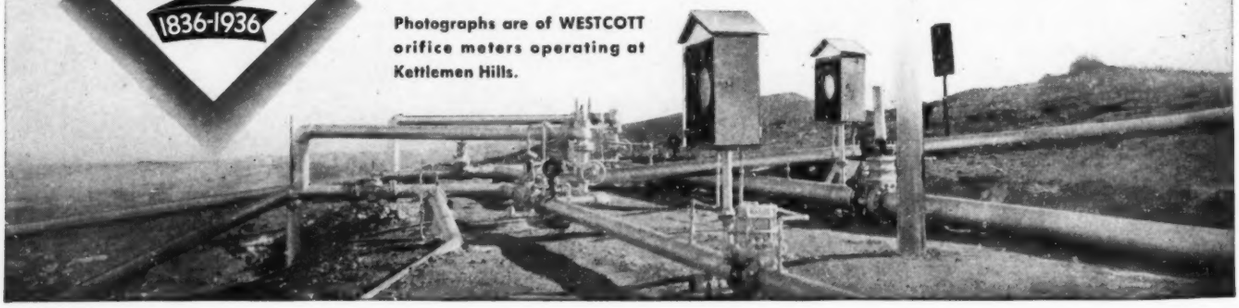
First, fewer moving parts . . . Second, ease in cleaning without interfering with adjustment . . . these and other specific features designed into WESTCOTT meters give them a ruggedness and a dependability recognized throughout the world.

If you haven't received your copy of Catalog EG-2 giving engineering data, please write us.

AMERICAN METER CO. MEASUREMENT ENGINEERS CENTENNIAL 1836-1936

AMERICAN METER COMPANY
INCORPORATED
Measurement and control of Gas, Oil, Steam, Air and Liquids
METRIC METAL WORKS • ERIE, PENNSYLVANIA

Photographs are of WESTCOTT orifice meters operating at Kettlemen Hills.



THE Petroleum Engineer

AUGUST 1936

VOLUME VII NUMBER XII

A MAGAZINE OF METHODS FOR OPERATING MEN

This Issue Contains

DRILLING AND PRODUCTION

	Page
Drilling-in Wells in the Oklahoma City Field Under Controlled Pressure By K. C. Sclater	25
Increased Use of Tractors and Modern Power Units in Eastern Oil Fields	31
Pumping With Electric Power in Robbins Pool, Kansas By G. H. Weckel and R. E. Patrick	33
Protecting Oil Sands by Directional Drilling By Alexander Anderson and T. K. Sawyer	36
Present Status and Future Possibilities of Acid Treatment in Illinois ields By Frederick Squires	40
Community-Operated Moore Pool Is Oklahoma's Latest Big Well Discovery	52
First Oklahoma State Well to Go On Production	55
Studies of Repressuring and Water-Flooding By Alfred H. Bell	60
Cable Tool Coring in the Mid-Continent and Texas Fields By Wallace A. Sawdon	74

REFINING AND NATURAL GASOLINE MANUFACTURE

Rerunning Acid-Treated Cracked Naphthas Over Alkalies By George M. Woods	38
Determining the Number of Sheets of Insulating Material Required in Refinery Ceilings and Walls	55
Bureau of Mines Analyzes Talco, Texas, Crude Oil	62
Refinery Rush Job Completed Without a Lost Time Accident By W. H. Reber	73

OIL AND GAS TRANSPORTATION

Engineering Skill Plays Important Role in Laying of Gas Pipe Line By L. E. Ingham	29
Cutting and Fitting Threads on Pipe Line Station Equipment By Joseph L. Ingram	44
Alignment Chart for Determining Power Required to Pump Crude Oil By Frank E. Hangs	46
Extensive Pipe Line Reconditioning Project By Frank H. Love	49

GENERAL

"Kinks" for Quarter-Turn Belt Drives By W. F. Schaphorst	42
Petroleum Demand Largest in History of Industry By William J. Kemnitzer	58
Fundamentals of the Internal Combustion Engine (Part 5) By Joseph Liston	65

REGULAR DEPARTMENTS

The Course of Oil	15
Highlights in Oildom	16
Progress of Major Pipe Line Work	18
Latest Activities in the Oil Fields	20 and 21
The Month's Activities in Refining	22
Pictorial Petroleum	73
Running Tour With Men in the Industry	90
Laugh With Barney	92
Machinery and Equipment	95, 98, 102, 104, and 105
Book Reviews	118
Trade Personals	116

Meetings

California Natural Gasoline Association—September 3, Richfield Building, Los Angeles.

•

Michigan Oil and Gas Exposition—August 11, 12, 13, 14, 15, and 16, Mt. Pleasant, Michigan.

•

American Chemical Society, Semi-Annual Meeting—September 7, 8, 9, 10, 11, and 12, Pittsburgh, Pennsylvania.

•

World Power (Fuel) Conference—September 7, 8, 9, 10, 11, and 12, Washington, D. C.

•

National Safety Congress, Petroleum Section—October 5, 6, 7, 8, and 9, Atlantic City, New Jersey.

•

American Petroleum Institute, 17th Annual Meeting—November 9, 10, 11, and 12, Stevens Hotel, Chicago, Illinois.

•

Independent Petroleum Association of America, Annual Meeting—November 30-December 1, Baltimore Hotel, Oklahoma City, Oklahoma.

COPYRIGHT—Each issue of The Petroleum Engineer is copyrighted. Any republication of the matter appearing in the magazine, either wholly or in part, is not permitted except by special authorization.

SUBSCRIPTION PRICE — Single copies 25 cents; Domestic and foreign, $2.00 per year, two years $3.00.

THE PETROLEUM ENGINEER PUBLISHING COMPANY

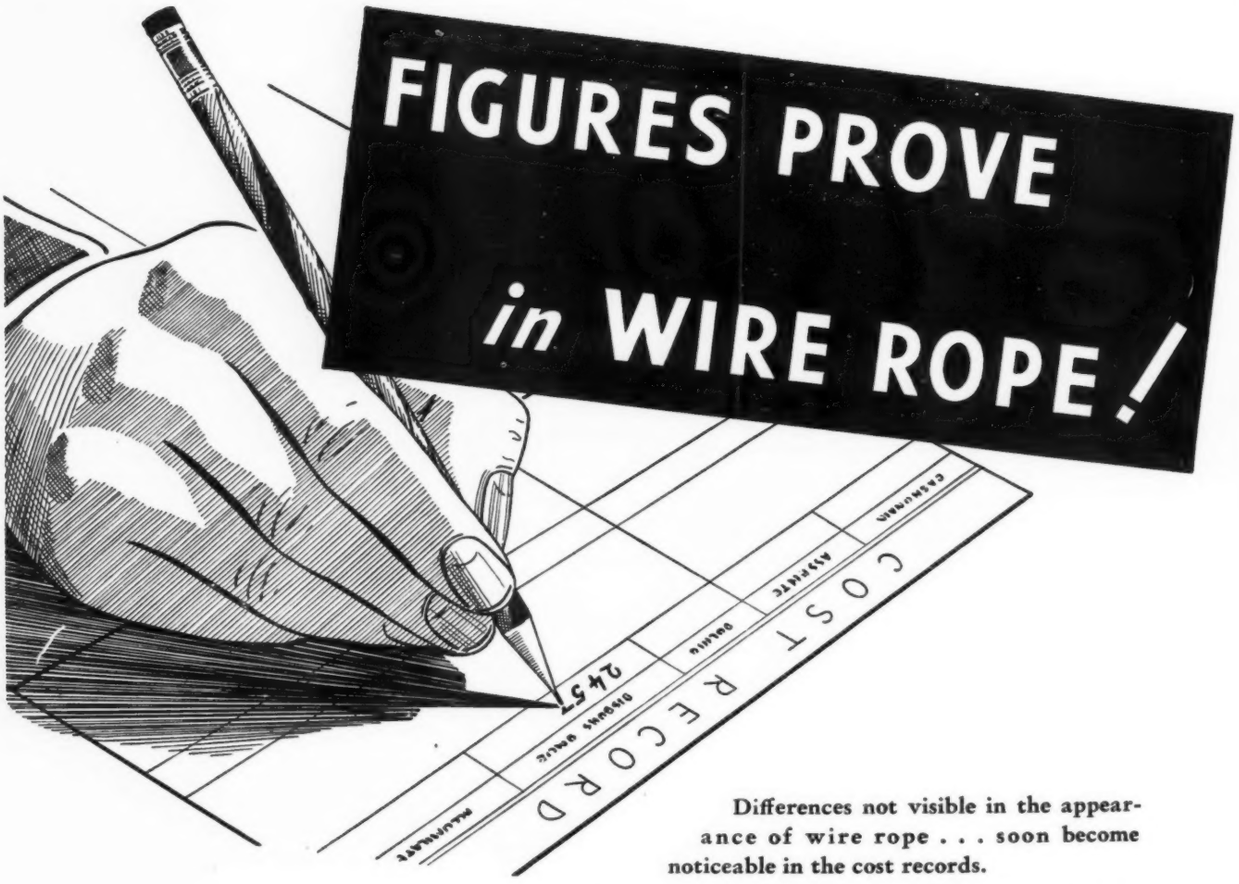
Tower Petroleum Building DALLAS, TEXAS

NEW YORK CITY
T. J. Crowley
Vice-President
101 Capitolian Blvd.
Rockville Center
Long Island, N. Y.

C. Morris - - - - *President-General Manager*
J. L. Dwyer - - - - - - - *Vice-President*
W. T. Bryan - - - - - *Secretary-Treasurer*
W. L. Love - - *Vice-President and Adv. Mgr.*
C. R. Barrett - - - - *Circulation Manager*
K. C. Sclater - - - - - - - - - *Editor*
Frank H. Love - - - - - - *Associate Editor*

LOS ANGELES, CALIF.
R. C. Wipperman
1311¾ North Hayworth
West Hollywood, Calif.
Telephone: HEmpstead 1885

MEMBER A. B. C.—MEMBER A. B. P.



Differences not visible in the appearance of wire rope . . . soon become noticeable in the cost records.

The value of "HERCULES" (Red-Strand) Wire Rope is a matter of simple arithmetic—the increase in its length of service means a decrease in its cost. Its real economy depends upon added performance . . . not on a price tag.

A sure way to keep your wire rope costs low is to specify "HERCULES" (Red-Strand). It is consistently dependable and longer lasting—as fine a rope as 79 years of experience can make it.

Made Only By

A. LESCHEN & SONS ROPE CO.

Established 1857

5909 Kennerly Avenue, St. Louis, Missouri

New York · Chicago · Denver · San Francisco · Seattle

Domestic Distributors:

CASEY & NEWTON
901 Century Building, Pittsburgh, Pa.
GULF HARDWARE & SUPPLY COMPANY
Corpus Christi, Texas
F. HAMILTON COMPANY, Inc.
Bradford, Pennsylvania
HERCULES SUPPLY COMPANY
Fort Worth, Texas
HILLMAN-KELLEY, Incorporated
2441 Hunter Street, Los Angeles, Calif.
HINDERLITER TOOL COMPANY
Tulsa, Oklahoma
NORVELL-WILDER SUPPLY COMPANY
Beaumont, Texas
OSBORN MACHINERY COMPANY, Inc.
Clarksburg, West Virginia
PARKERSBURG SUPPLY COMPANY
Parkersburg, West Virginia
STRAKER & TROUT
Mt. Pleasant, Michigan
UNION PIPE AND SUPPLY COMPANY, Inc.
Owensboro, Kentucky
UNITED PIPE AND SUPPLY CORP.
Charleston, W. Va. · Paintsville, Ky.

Export Distributor:

CONTINENTAL EMSCO COMPANY, Inc., No. 30 Rockefeller Plaza, New York, N. Y.
Branches: Buenos Aires - London - Ploesti

The Course of Oil

By K. C. SCLATER

Uniform Oil Legislation

Delegates from several of the leading non-member oil-producing states voiced approval of the work of and the benefits derived from the Interstate Compact Commission at its meeting held recently in Dallas. These sentiments are encouraging, indicating as they do a willingness to coöperate in following sound, uniform policies for the conservation of oil and gas. They may presage a continuation of the Compact. Whether or not the Compact should continue to function beyond 1937, will be considered by a committee appointed to go into this question and report at the next meeting to be held early in October. The fact that membership in the Compact is voluntary and that it has the approval of the Federal Government strengthens its already far-reaching possibilities as a constructive instrument for conserving oil and gas and stabilizing the industry. One delegate made the observation to the effect that compacting states might be freed from many of the federal investigations to which they now are subject.

An example of the effective and constructive work that the Compact Commission is capable of sponsoring is that with respect to uniform laws and regulations governing the conservation of oil and gas. These statutes vary widely among the different oil-producing states and also the federal government. A definite need exists not only to simplify them but also to make them more uniform as between states. They are in many instances highly conflicting and quite frequently require interpretation by the courts. Companies and individual operators are required to submit the same type of information in an entirely different form, depending on where they operate, in order to comply with state and federal regulations. So many and at variance are these laws and regulations that progress is retarded, malpractices encouraged, and an unnecessary burden imposed on the industry.

A beginning toward alleviating this onerous condition has been made by the Interstate Compact Commission. A subcommittee has just completed a preliminary survey of state and federal laws and regulations. Some idea of the task confronted and the thoroughness with which the survey was conducted may be gained from the fact that a tentative outline prepared grouped such oil and gas statutes under some one hundred and four heads. Laws and regulations of twenty oil-producing states and the United States Government were included in the survey.

Homer Hoch, Kansas representative, emphasized the fact that the Compact Commission must endeavor to point out ways and means of conserving oil and gas resources of the nation to justify its existence, for the Compact Commission has not been created as a direct agency to benefit the oil industry. In other words, whatever benefits accrue to the oil industry must inure to the public. By keeping this point of view constantly before it the Compact can continue to contribute to the well-being of the industry and at the same time function in the public interest.

Proper Well-Spacing Advocated

In a recent address by the president of the American Petroleum Institute, certain principles of production were advocated, the purposes of which are in full accord with sound conservation of the type the Compact Commission fosters. And since the Compact is under discussion, it may be well to point to the principles so advocated. "* * * proper well-spacing and the acreage factor in proration are the most important elements in reducing development and lifting costs and in maintaining essential bottom-hole pressures. Proper well-spacing results from wise coöperation among the competing operators in the development of a pool, even where unit development for one reason or another is not practicable or attainable. I can think of no more constructive work which can be done by operators than constantly to study their investments in their land departments and the length of time, under present trends, that will be required to recover their capital—to say nothing of a profit—out of developed properties. Reflection on these figures will probably result in instructions to see to it that in every step of the way, from the leasing or purchasing of lands to their ultimate development, proper well-spacing is observed—with consequent reduction in development, and operating costs. Were the subject given the study which it deserves, I apprehend that we should find that proration of production is not the cause of increasing investment accounts without proportionate increases in either dollar income or volume of production, but that the real cause for complaint is against continuing intensive competitive drilling. Development and operating costs can be reduced and full production obtained by wider spacing of wells, more coöperative development programs and, where possible, by unit operations."

"* * * As immediate and continuing responsibility rests upon the purchasers of leases so to plan their development as to reduce to the utmost unnecessary drilling and to create, wherever possible, situations looking to unit operations or, at the very least, to planned development and well-spacing. If it be in the public interest to produce the most oil at the least expense, it equally is to the interest of the industry to minimize, as much and as rapidly as possible, the tremendous expenditures in unnecessary drilling which diminish the allowable per well under proration and retard the recovery of capital—to say nothing of profits.

"Proper well-spacing assures the maximum yield from each pool, and contributes to the welfare of both the public and the industry now and in the years to come. By proper well-spacing we mean development in accordance with sound engineering practices, which it is recognized differ in the various pools and sometimes in different parts of the same pool. Engineering knowledge has so far developed in recent years that there now can be no valid reason for ignoring it."

« « « HIGHLIGHTS IN OILDOM » » »

Louisiana Deep Well Being Watched

The Continental Oil Company's No. 1 Alvin Hebert, at Abbeville, Vermilion Parish, Louisiana, is being watched closely by members of the oil industry. At latest reports (August 6) the test had reached a depth of 11,311 ft., and Continental engineers have expressed the belief that conditions are favorable for drilling to at least 13,000 feet. If this is accomplished it will be the deepest hole ever to be drilled. The record to date is the Gulf Oil Corporation's No. 103 McElroy in West Texas, which was abandoned after reaching a depth of 12,786 feet.

No. 1 Alvin Hebert already has established one record, when 10,947 ft. of 7-in. casing was landed and cemented. The string was set with approximately 2000 sacks of cement and ten tons of ice.

•

10-Acre Spacing Rule for McCamey and Taft Fields

The Texas Railroad Commission has issued a 10-acre spacing rule for the McCamey field, Upton County, Texas. The field was drilled on a 10-acre basis under a general agreement of operators, and they asked for a formal rule recently when an operator who acquired acreage in the field threatened to disregard the agreement.

The commission also prescribed a 10-acre spacing rule for the Taft field of San Patricio County. The field is approximately six months old and has ten producing wells. Wells drilled into the Plymouth sand or deeper are required by the ruling to be spaced according to the rule applicable to the Plymouth field, which is one well to every 20 acres.

•

To Repressure Shallow Sands

Several shallow sand areas near Burkburnett, Texas, controlled by the Magnolia Petroleum Company, are to be repressured with gas, the equipment to be installed within the next few months. Preliminary tests were made in a 1750-ft. sand southwest of Burkburnett townsite, and, having proved successful, first installations will be made in this area.

The majority of the wells have been producing for 20 years and are making about two barrels per day each. Input wells will be drilled near the center of each 160-acre section. The gas will be delivered by a natural gas company at a minimum pressure of 125 lb., thus eliminating the need for compressor stations.

•

To Develop Buena Vista Hills Co-operatively

The Buena Vista Hills, California, oil and gas field will be developed on a co-operative basis, according to an agreement reached between government lessees, owners and operators on private lands, and government officials. The agreement comes after three years' negotiation between the parties involved.

The principal purposes of the decision to develop the area on a unit plan are the conservation of oil and gas on both government-owned and private lands, particularly in the deeper horizons that are not undergoing development at present, and to prevent unrestricted drilling.

Involved in the plan are 39,184 acres of oil lands, 10,446 acres of which are government lands in Naval Reserve No. 2, 4000 acres of government land outside the reserve, and 24,738 acres privately owned. Of the latter, 18,735 acres are within the reserve.

•

To Drill in Western Nebraska

In an attempt to give Nebraska its first oil well Byrd-Frost, Inc., and the Magnolia Petroleum Company have contracted to Helmerich and Payne, Inc., contractors of Tulsa, Oklahoma, the sinking of a 7800-ft. test four miles due northeast of the town of Hyannis. The exact location is 2260 ft. east and 250 ft. south of the northwestern corner of 22-24n-38w.

Byrd-Frost, Inc., initiated the project, obtaining ten-year leases on 725,000 acres, and sold the Magnolia Petroleum Company approximately one-fourth interest in their holdings. The location of the first well was made after seismograph exploration was carried out on 500,000 acres of the block.

In speaking of the possibilities, D. H. Byrd stated: "We have four definite chances of procuring production: the Sundance at approximately 3500 ft., the Dakota, the Niobrara, and the Lakota. The seismograph exploration revealed several good structures. The block possesses several hundred feet of closure to the north, south, and east, and the closure to the west against 400 to 500 ft. of thrown fault continues entirely through Grant County, and several closed structures were discovered against both the upthrow and down-throw side of this fault."

•

Push Oil Drilling in Australia

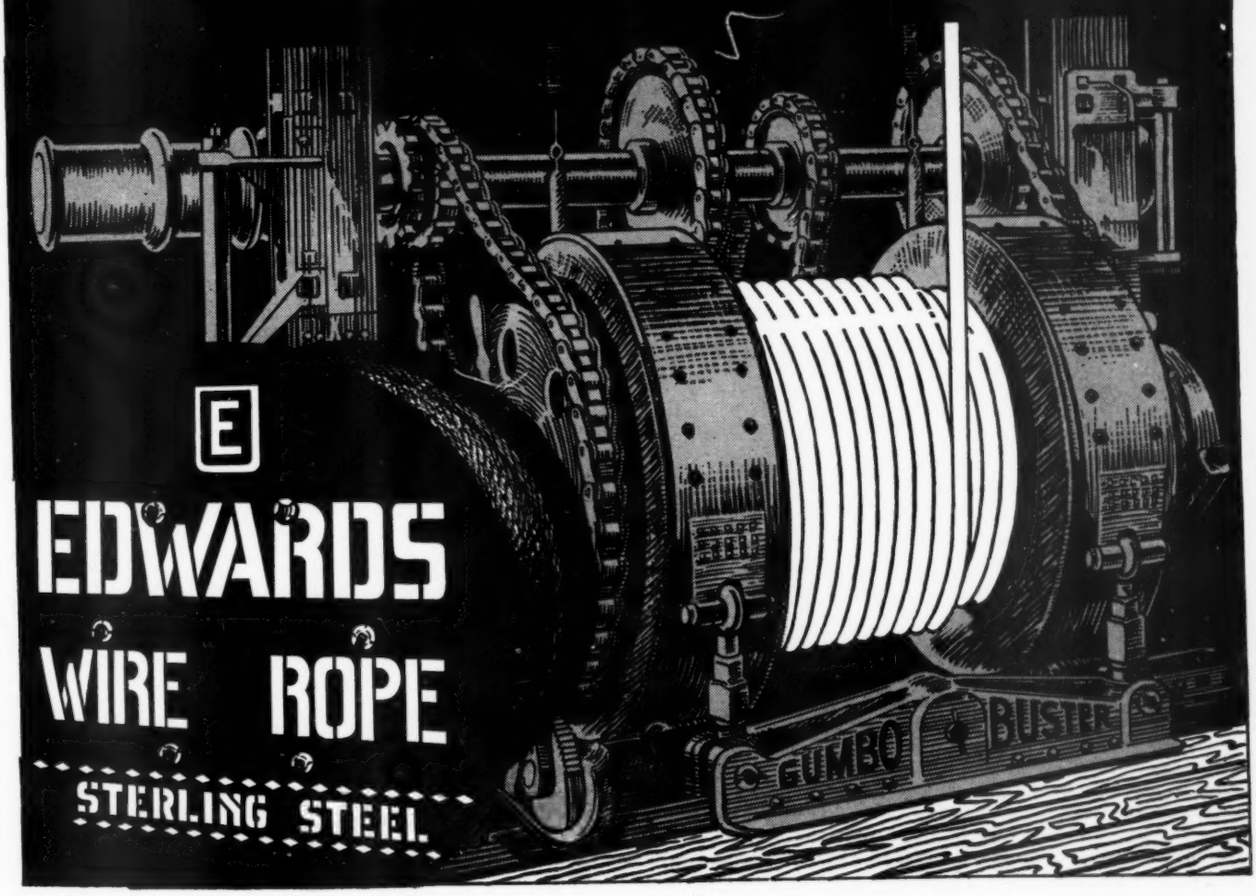
The Australian government is taking practical steps to stimulate drilling in that Commonwealth. Recently it was announced that approved companies or persons would be lent dollar for dollar up to 250,000 pounds (approximately $1,250,000) for oil drilling.

•

Louisiana's New Conservation Law

Louisiana's new conservation law, discussed for some time, finally has been enacted. The law provides that, in order to conserve the oil, natural gas, sulphur, and other resources of the state, and to prevent the waste and depletion thereof, the production, purchase, transportation, and handling of these products in excess of reasonable market demand is prohibited. The commissioner of conservation is to determine what shall be considered as "in excess of reasonable market demand." He also is authorized to prescribe rules, regulations, and orders, and to conduct hearings for the enforcement of the act, as well as to provide penalties for violations.

WIRE LINE PERFORMANCE



E

EDWARDS

WIRE ROPE

STERLING STEEL

PROGRESS OF MAJOR PIPE LINE WORK

LAYING of the Texas-Empire Pipe Line Company's 143-mile 10-in. line from Valley Center, Kansas, to Sheldon, Missouri, is approximately 75 percent completed, and it is expected to be ready for the transportation of crude oil by September 1st. Its construction will provide a direct route for western Kansas crude to Illinois refineries by connecting to the Texas-Empire's trunk line extending from Oklahoma, across Missouri, to points in Illinois. The loops being laid to the main line in Missouri and Illinois also are expected to be completed by September 1st. The latter, which are of 12-in. pipe, will increase the capacity of the line approximately 20,000 bbl. daily.

•

An announcement has been made that will be well received by western Kansas operators. The Kaw Pipe Line Company is to extend its facilities to serve the Silica and Schartz pools in Rice and Barton counties, and to two new pools recently opened in Ellis County. A nine-mile 6-in. extension will be laid from the Lyons station in Rice County to the Silica pool, together with several miles of 4-in. gathering lines. The latter also will take crude from the Schartz pool. Four-inch lines will be laid to the new area northwest of Ruder in Ellis County, and to the one southeast of Ruder. Both lines will be approximately nine miles in length.

•

September 15th is the date set for the completion of the 6-in. gasoline line being constructed by the White Eagle Division, Socony-Vacuum Oil Corporation, from its refinery at Augusta, Kansas, to Kansas City, Kansas. The line will be 178 miles in length and will traverse some rugged country, especially between Tonganoxie, Kansas, and Kansas City. Two crews have been working since the project was started and last week a third was added. Half of the line will be coated, and the remainder will be laid without covering. The 40-ft. lengths of pipe are being acetylene-welded.

•

The Peoples Natural Gas Company of Pittsburgh, Pennsylvania, has awarded a contract to Williams Brothers of Tulsa, Oklahoma, for the construction of a 113-mile line that will run from a point near Limestone township in Clarion County through Hebron township in Potter County and Red Bank township in Clarion County to terminate at Wayne township in Armstrong County, Pennsylvania.

The pipe will be 12¾ in. O.D. and the line will be Dresser coupled. It is expected to be completed by November 15th.

•

The Penn-York Natural Gas Corporation has announced the construction of a 140-mile combination 8-in. and 10-in. pipe line from Coudersport, Potter County, Pennsylvania, to Arcade, New York, via Dunkirk and Batavia. Sheehan Brothers and Williams Brothers, both of Tulsa, Oklahoma, have been given the contracts for the laying of the line, which will be completed about October 1st. Eighty miles of 8-in. pipe will be supplied by the A. O. Smith Corporation of Milwaukee, Wisconsin. Sixty miles of 10-in. electric-welded pipe will be supplied by the Republic Steel Corporation, Cleveland, Ohio, to be shipped from the company's mills at Youngstown, Ohio.

Demand will determine the capacity of the line. It will be capable of carrying up to 20,000,000 cu. ft. daily with the proper station facilities.

•

A 114-mile 8-in. welded gasoline pipe line will be laid for the Sun Oil Company from Marcus Hook, Pennsylvania, to the company's terminal at Newark, New Jersey, it has been announced. The Mitchell Stewart Construction Company of Dallas, Texas, has been awarded the contract and pipe will be supplied by Jones and Laughlin, Pittsburgh, Pennsylvania.

That portion of the line to be laid in Pennsylvania will be constructed for the Susquehanna Pipe Line Company, and that in New Jersey for the Middlesex Pipe Line Company.

•

The Keystone Pipe Line Company, transportation subsidiary of the Atlantic Refining Company, is to construct a 75-mile 8-in. branch from its gasoline line that extends from Philadelphia to Pittsburgh. The extension will tie in at the Quentin station near Cornwall and will run to Williamsport, Pennsylvania, via Sunbury. The project is scheduled to be completed by the end of the year.

The Keystone has just recently completed the laying of a 57-mile 8-in. loop to its trunk line system, between Montello and Mechanicsburg, paralleling a 6-in. line that has been in service since the latter part of 1931.

•

The Panhandle Eastern Pipe Line Company has awarded to the J. R. Stewart Construction Company a contract for approximately 15 miles of gathering lines in the vicinities of Dumas, Texas, and Hugoton and Liberal, Kansas. The lines will be 16 in., 12 in., 8 in., 6 in., and 4 in. in diameter and will be oxy-acetylene welded by the Lindeweld method. Construction will start about August 17th.

•

Work has started on the 8-in. line of the Humble Pipe Line Company from its pumping station at Longview, Texas, to the Talco field in Titus County. The line, which will be 67 miles in length, is expected to be completed early in October. It will be the first pipe line outlet for the new field. The line will follow the route of the old Port Bolivar and Dangerfield Railroad for a distance of seven miles north of Longview, and then will go in an almost straight line direct to the Talco field.

•

A contract for a 30-mile 6-in. oil line has been awarded to the Osage Construction Company by the Stanolind Pipe Line Company. The line will extend from the Stanolind's Fairport junction in Kansas to the new production in the Bemis pool in Ellis County, Kansas. The line will be oxy-acetylene welded by the Lindeweld method, and construction work is underway, having started near Hutchinson, Kansas.

. . . with Multi-Flame Lindewelding

Multi-Flame Lindewelding on a 143-mile 8 in. pipe line. Shown on the gas wagon with the cylinders of Linde Oxygen is an Oxweld Type MP-4 Acetylene Generator.

The three flames of the Multi-Flame Lindewelding Head improve the metallurgy of welds. The small flames preheat, while the large flame welds and post-heats.

you can make Strong, Ductile Welds

Multi-flame Lindewelding, when done properly, produces welds that are as strong as the pipe base material, even when the tensile strength is 110,000 lb. per sq. in. In Lindewelding a minimum of base metal is melted into the puddle. Thus both the efficiency of welding and the uniformity and quality of the weld metal are increased.

By the use of the multi-flame the base metal is preheated before welding and post-heated for slower cooling after welding. This exclusive feature of Multi-Flame Lindewelding makes the weld unusually ductile.

Multi-Flame Lindewelding is fast and economical even under the varied conditions that exist in the field. It saves 15 to 40 per cent in oxygen, acetylene and welding rod consumed, and often as much as 50 per cent in time required to make welds.

The Multi-Flame Lindewelding process is a result of the closely coordinated laboratory, development and field engineering facilities of the Linde organization. It reflects the vast welding experience achieved through the application of Linde Process Service on more than 20,000 miles of pipe lines. Why not have Linde work with your engineers on their next pipe line project? This help is available from a Linde Office near you. Write or phone for complete information. The Linde Air Products Company—Unit of Union Carbide and Carbon Corporation—New York and Principal Cities.

Everything for Oxy-Acetylene Welding and Cutting

LINDE OXYGEN • PREST-O-LITE ACETYLENE • OXWELD APPARATUS AND SUPPLIES

FROM PRODUCTS OF UNITS OF UCC UNION CARBIDE AND CARBON CORPORATION LINDE UNION CARBIDE

LATEST ACTIVITIES IN THE OIL FIELDS

OPENING of a new field in Chambers County, Texas, in the Gulf Coast area, is indicated. No. 1 Kilgore Estate of Glenn H. McCarthy, approximately two and one-half miles northwest of Salt Dome wells in the county, showed an estimated 1750 ft. of 28-gravity oil on a ten-minute drill stem test between 6300-6308 feet. Flow was through a ¼-in. choke at the bottom of the hole and a ⅜-in. choke at the top of the hole.

●

American Exploration Company's No. 1 Exploration, in Kern County, California, was completed recently pumping 150 bbl. of 13-gravity oil daily, cutting five percent. This well is one mile northwest of the nearest production in the Kern Front field and may be either an extension of that field or the opening of a new pool. The well is drilled to a total depth of 2862 feet.

●

The Amerada Petroleum Corporation and the Stanolind Oil and Gas Company have opened a new producing area in Seminole County, Oklahoma, with their No. 1 Klabzuba, situated between the Stout and Keokuk pools. Production is from the Wilcox, topped at a depth of 4622 ft., and the well swabbed 385 bbl. the first 15 hours.

●

Kansas operators continue their practice of discovering new pools in bunches. Five new pools have been added to the state's total within recent days. The Kansas Oil Development Corporation and the Creekmore Oil Company's No. 1 Haller has opened a new pool 16 miles north of Hays in Ellis County. Total depth is 3033 feet.

No. 1 Love of Seigrist and Miller has given Reno County its tenth pool. The well is 14 miles southwest of Hutchinson, and, at a total depth of 3551 ft., produced 443 bbl. of oil on a 24-hour test. No. 1 Rick of the Rosespring Drilling Company, four miles north of the Silica pool, opens another pool for Barton County. South of Leon in Butler County, No. 1 Fred Pettit of Robert E. Ellis is a pool opener; and Stanolind Oil and Gas Company's No. 1 Donovan in Edwards County is looked upon as being the possible discoverer of a new pool.

●

No. 1 Oard of Goll, Graves and Mechling, in Buckeye Township, Michigan, is being regarded as a likely discovery well. While being deepened from 3566 ft. to 3670 ft. the test swabbed 15 bbl. of oil daily. It was to be plugged back approximately 15 ft. and acidized. The well is eight miles northeast of the Beaverton pool.

●

The Shell Petroleum Corporation has dicovered a new field in Jefferson County, Texas, in the Gulf Coast area with its No. 1 Carpenter. The well, in the Nome prospect, was brought in flowing 574 bbl. of 26.9-gravity oil per day through a ¼-in. choke. Production is from the Marginulina sands at a total depth of 6005 feet.

●

The discovery well in the Quealy Dome field of Albany County, Wyoming, has been deepened to 3263 ft. in the Dakota sand, resulting in a flow of 450 bbl. daily. The well is The California Company's No. 1 Holst and was brought in in April of last year at a total depth of 3236 feet. At that time it made 600 bbl. daily, but production since has fallen off.

●

Mike Hogg's No. 1 Lawes Realty Company, near Clarenton, St. Mary Parish, Louisiana, showed saturated oil sand on a drill stem test made in the Miocene formation at a depth of 4181 ft., indicating a new field for the Louisiana Gulf Coast.

AVERAGE CRUDE PRICES

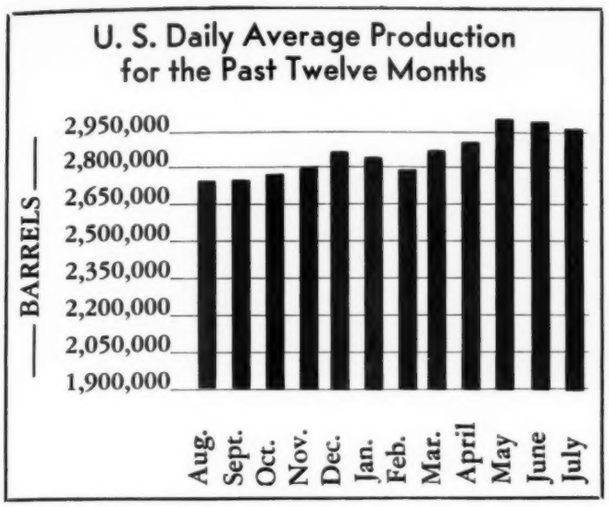
California	
Kettleman Hills	$1.22-1.43
Playa Del Rey	1.10
Coalinga	.70-.90
Signal Hill	1.10
Montana	1.45
Wyoming	1.10
Colorado	1.00-1.10
New Mexico	.75-.95
Texas	
North Central	.84-1.08
Panhandle	.81-.98
West Texas	.75-.95
Gulf Coast	.85-1.30
Darst Creek	.88-1.22
East Texas	1.15
Kansas	1.10
Oklahoma	1.10
Arkansas	.75-.80
Louisiana	
Gulf Coast	$ .82-1.22
North Louisiana	.86-1.10
Illinois	1.23
Kentucky	1.23
Indiana	1.12
Ohio	
Lima	1.25
Michigan	1.12
Pennsylvania	
Bradford	2.45
Southwest	2.17
Eureka	2.12
Buckeye	1.97
Corning	1.42
West Virginia	1.67
Canada	2.10-2.17

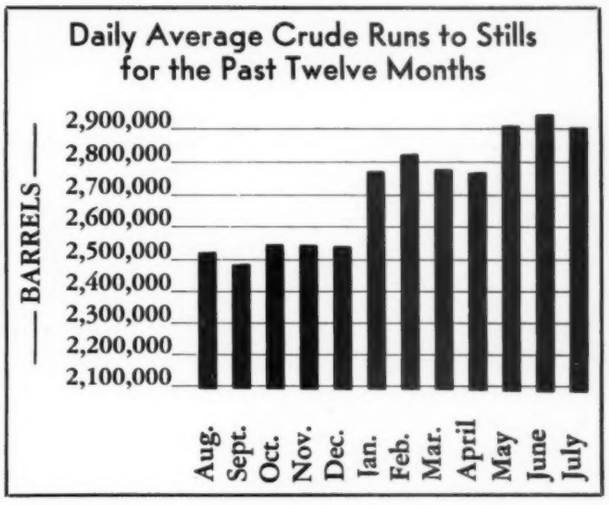
DAILY CRUDE OIL PRODUCTION

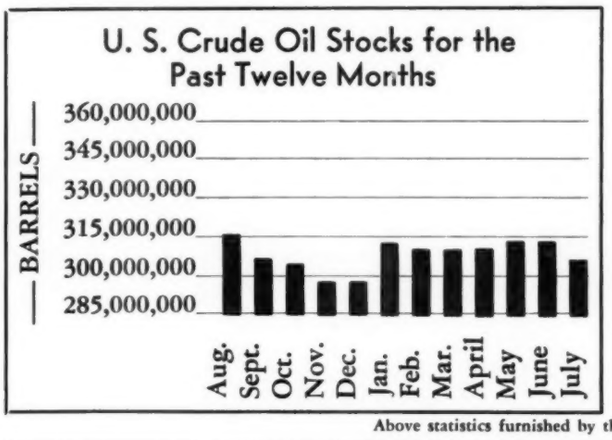
Data Supplied by A.P.I.

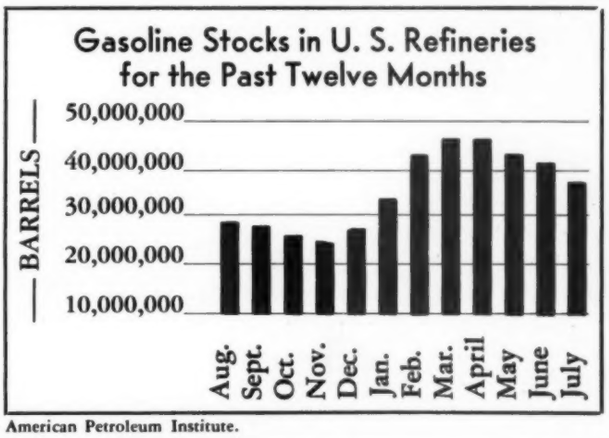
(Figures in Barrels)

	B. of M. Dept. of Interior Calculations (July)	Week Ended Aug. 1 1936	Week Ended June 27 1936	Week Ended Aug. 3 1935
Oklahoma	569,800	541,100	555,300	498,800
Kansas	164,200	156,000	146,000	145,700
Panhandle Texas		61,950	65,250	51,900
North Texas		59,850	59,000	56,950
West Central Texas		26,300	25,300	26,050
West Texas		180,250	180,950	151,550
East Central Texas		57,650	53,700	47,050
East Texas		429,100	440,100	432,900
Southwest Texas		84,300	86,250	56,550
Coastal Texas		252,900	254,600	180,450
TOTAL TEXAS	1,146,500	1,152,300	1,165,150	1,003,400
North Louisiana		84,150	76,350	24,800
Coastal Louisiana		147,750	146,400	113,000
TOTAL LOUISIANA	186,800	231,900	222,750	137,800
Arkansas	31,300	29,650	29,650	30,350
Eastern	107,700	113,200	110,100	107,100
Michigan	33,800	35,500	36,850	45,700
Wyoming	38,800	39,150	36,900	40,250
Montana	13,400	15,700	16,950	11,450
Colorado	4,700	4,650	5,200	4,050
New Mexico	69,400	74,150	73,100	53,950
TOTAL EAST OF CALIF.	2,366,400	2,393,300	2,397,950	2,078,550
California	550,800	554,700	571,200	555,800
TOTAL U. S.	2,917,200	2,948,000	2,969,150	2,634,350









Above statistics furnished by the American Petroleum Institute.

Summarized Operations in Active Fields for July, 1936

Fields	Completions	Producers	Rigs	Drilling Wells	Depth of Production	No. Casing Strings	Gravity of Oil	Type of Tool Used
Texas								
East Texas	255	239	70	97	3600	2	40	Rotary
Duval County	107	85	38	61	2300	2	22	Rotary
Archer County	50	16	18	33	660–1800	1 or 2	40	Rot.-Cab.
Conroe	4	4	1	3	2000–7400	3 or 4	40	Rotary
Panhandle	58	55	40	170	2200–3900	2	40	Rotary
Refugio County	11	9	3	13	5200	2	38	Rotary
Oklahoma								
Oklahoma County	67	62	16	49	6500	3	39	Rotary
Pontotoc County	61	56	42	72	1800–4488	2 or 3	38	Rotary
Osage County	21	17	8	46	380–2850	2	37.5–40	Rot.-Cab.
Kansas								
McPherson County	11	9	2	15	2900–4300	2	38	Rot.-Cab.
Ellsworth Arch	126	99	34	169	3300	4	37	Rot.-Cab.
Louisiana								
Rodessa	38	38	13	51	5985–6450	3	39	Rotary
California								
Kettleman Hills	4	4	4	27	8300	3 or 4	40	Rotary
Long Beach	0	0	1	4	7000	3	36	Rotary

Field Activities by States for July, 1936

State	Completions		Producers		Locations		Rigs		Drilling Wells		Production, 1935 (In Barrels)
	July	June	July	June	July	June	July	June	July	June	
Arkansas	14	9	3	2	4	5	12	12	30	38	11,140,750
California	82	104	76	92	103	89	124	120	238	231	207,899,480
Colorado	....	2	....	2	....	....	5	4	33	28	1,565,150
Illinois	9	14	5	10	....	....	21	16	17	14	4,352,000
Indiana	12	13	9	11	....	....	8	5	30	72	762,000
Kansas	184	177	140	137	141	121	51	57	274	308	53,013,450
Kentucky	33	14	26	13	....	....	5	7	22	17	4,860,000
Louisiana	95	109	72	81	76	93	62	67	211	226	50,299,950
Michigan	74	91	60	64	70	65	79	80	125	122	15,661,350
Mississippi	1	3	0	0	....	....	2	1	11	8	Gas. Prod.
Montana	21	21	18	19	....	....	14	12	69	68	4,304,100
New Mexico	52	69	50	63	....	....	23	22	124	121	19,195,500
New York	....	....	....	....	....	....	2	1	8	2	3,191,900
Ohio	166	117	120	85	....	....	51	44	197	180	4,234,000
Oklahoma	319	364	267	268	207	215	64	75	536	618	181,152,050
Pennsylvania	....	....	....	....	....	....	20	11	136	110	14,478,000
Texas	1194	1266	902	978	1107	1414	690	710	1980	2036	377,747,205
West Virginia	32	64	24	50	....	....	34	38	151	134	3,818,400
Wyoming	8	8	7	7	....	....	12	16	62	83	13,390,100
Totals	2296	2431	1779	1872	1708	2002	1279	1298	4254	4416	970,995,385

THE MONTH'S ACTIVITIES IN REFINING

Percent Refinery Capacity Operated

Western Division, 73.6 percent **Central Division, 76.3 percent** **Eastern Division, 82.0 percent**

THE lubricating oil plant of the Lion Oil Refining Company at El Dorado, Arkansas, will be enlarged, according to an announcement made by T. H. Barton, president. Work is scheduled to be completed and production started by January 1st. The company recently completed the erection of a still in the asphalt plant that will increase production 25,000 tons annually.

●

The Magnolia Petroleum Company is constructing a natural gasoline plant five miles north of Kermit. Another gasoline plant being erected in the area is that of Smith Brothers, approximately four miles north of Kermit.

●

Improvements recently have been made at the Grandfield, Oklahoma, refinery of the Bell Oil and Gas Company. The capacity of the Dubbs cracking plant has been increased to 4000 bbl. a day of straight refining and 3000 bbl. daily cracking.

●

The Waggoner Refining Company, Electra, Texas, is converting two of its cracking units into a single cracking unit to operate the Dubbs two-coil selective cracking process, full flashing. The Dubbs unit will include stabilizer and absorption equipment. The work is being done by the Waggoner company with the assistance of Universal Oil Products Company engineers.

The two cracking units that are being converted have been running approximately 1600 bbl. of topped crude a day. The Dubbs unit will crack 2500 bbl. a day.

●

A contract has been awarded to Arthur G. McKee and Company, Cleveland, Ohio, architects and engineers, by the Shell Petroleum Corporation for designing and constructing a combination unit equipped for cracking adjoining its plant at Houston, Texas. The new unit will have a capacity of 16,000 bbl. of crude a day and will require nine to ten months to complete.

The refinery of the Corpus Christi Refining Company at Corpus Christi, Texas, is to be improved, it has been announced by officials of the company. The work will include a 5000-bbl. refining unit to supplement the existing 3000-bbl. unit, a vapor-recovery plant to handle 1,500,000 cu. ft. of gas a day, as well as 330,000 bbl. of storage. The Wyatt Metal and Boiler Works of Dallas and Houston has been given the contract for the refining unit and the storage, and the Petroleum Engineering Company will construct the vapor-recovery plant.

●

Stearns-Roger Manufacturing Company of Denver, Colorado, has been awarded a contract by the Shamrock Oil and Gas Corporation of Amarillo, Texas, for the construction of a butane polymerization plant in Moore County, Texas. It will be erected adjacent to the McKee gasoline plant of the Shamrock.

●

The Atlantic Refining Company is installing a Gray Process unit at its Franklin, Pennsylvania, refinery to refine cracked gasoline.

●

The H. A. Montgomery Company of Detroit, Michigan, has completed a refinery for the manufacture of lubricating oil at Blue Pigeon, Ohio, near Findlay. A chemical compounding plant also may be constructed, it is announced.

●

Two refineries have been announced for Gainesville, Texas. The Gainesville Refining Corporation will erect a plant with an initial capacity of 2000 bbl. of crude daily. The Tydal Refining Company, of which Mac Hall is the principal owner, will construct the second plant and it also will have a daily capacity of 2000 barrels. Both refineries will operate on crude from the Anderson-Kerr field, two and one-half miles southeast of Gainesville.

Crude Runs to Stills, Gasoline and Gas and Fuel Oil Stocks
Week Ended August 1, 1936
A.P.I. Figures
(Figures in Barrels of 42 Gallons Each)

DISTRICT	Percent Potential Capacity Reporting	Daily Avg. Crude Runs to Stills	Percent Operated of Total Capacity Reporting	Total Motor Fuel Stocks Thousands of Bbl.	Gas and Fuel Oil Stocks Thousands of Bbl.
East Coast	100.0	497,000	81.2	18,040	11,235
Appalachian	94.8	106,000	72.6	2,281	538
Ind., Ill., Ky.	96.1	410,000	92.3	9,234	5,196
Okla., Kans., Mo.	84.8	287,000	74.7	5,923	3,461
Inland Texas	48.5	109,000	68.1	1,309	1,591
Texas Gulf	96.8	601,000	91.3	6,843	7,783
La. Gulf	96.4	124,000	76.1	1,960	2,460
No. La.-Ark.	90.0	40,000	55.6	321	431
Rocky Mt.	61.9	50,000	83.3	1,115	792
California	92.6	504,000	63.9	12,342	72,924
Reported	89.7	2,728,000	78.2	59,368	106,411
Est'd. Unreported	.....	182,000	.....	5,459	2,445
*EST'D TOTAL U.S. Aug. 1, '36	.....	2,910,000	.....	64,827	108,856
*EST'D TOTAL U.S. July 25, '36	.....	2,990,000	.....	65,819	107,595
U. S. B. of M. July, 1935	.....	2,739,000	.....	**56,446	**108,322

*Bureau of Mines basis currently estimated.
**As of July 31, 1935.

—Ready for YOUR Job of

ACID TREATING

Every CHEMICAL PROCESS COMPANY operator is a man who not only KNOWS formations and pressures, but has had that actual, practical experience in the oil business which enables him to give any particular formation exactly the right acid treatment for best results.

The CHEMICAL PROCESS COMPANY is ready for immediate service throughout the States of Texas, Oklahoma, Kansas, New Mexico and Louisiana. Our laboratory is at your service for free tests of samples.

Phone, wire or write your nearest Chemical Process Company service station (listed below)

CHEMICAL TREATMENT OF OIL AND GAS WELLS

THE CHEMICAL PROCESS CO., Inc.

MAIN OFFICES
BRECKENRIDGE
TEXAS
PHONE
206

WICHITA, KANSAS—
Tel. 2-2478—RUFUS CLAY.

RUSSELL, KANSAS—
Tel. 493—C. R. VINCENT.

WICHITA FALLS, TEXAS—
Tel. 2-4307—W. E. (Bill) NORTON.

BRECKENRIDGE, TEXAS—
Tel. 206—P. W. PITZER, C. K. WEST, C. F. HOGAN, G. R. WHITNEY.

LULING, TEXAS
Tel. 365—J. G. High.

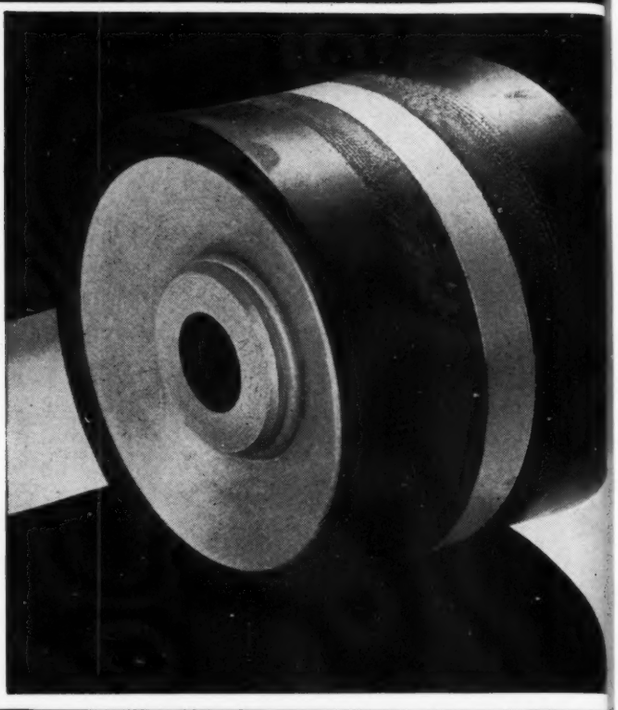
WEST TEXAS-NEW MEXICO—
D. B. STRIPLIN, Manager.
ODESSA, TEXAS—Tel 21.
HOBBS, NEW MEXICO—Tel. 444.

SEMINOLE, OKLAHOMA—
Tel. 844—J. B. D. WOODBURN.

WHY

PISTONS

pump ... keep cost



- LIGHTEST WEIGHT PISTON ON THE MARKET
  - • eliminates drag
- DROP FORGED • CHROME NICKEL BODY ONE-PIECE CONSTRUCTION • •
  - • resists any pressure
- REPLACEABLE RUBBERS and PERMANENT BODY • • SAVE 50 PER CENT PISTON UPKEEP
  - • give three times greater wiping surface, eliminating by-passing thereby lengthening the life of the piston and liner.

COMPETITIVE RUNS INVITED TO PROVE THIS GUARANTEE—The MISSION MANUFACTURING COMPANY **unconditionally guarantees** the MISSION PISTON to be perfect in workmanship and material; and that it is the most economical piston on the market to operate.

Sold through Supply Stores everywhere

MISSION MANUFACTURING CO.

HOUSTON, - - - - - TEXAS

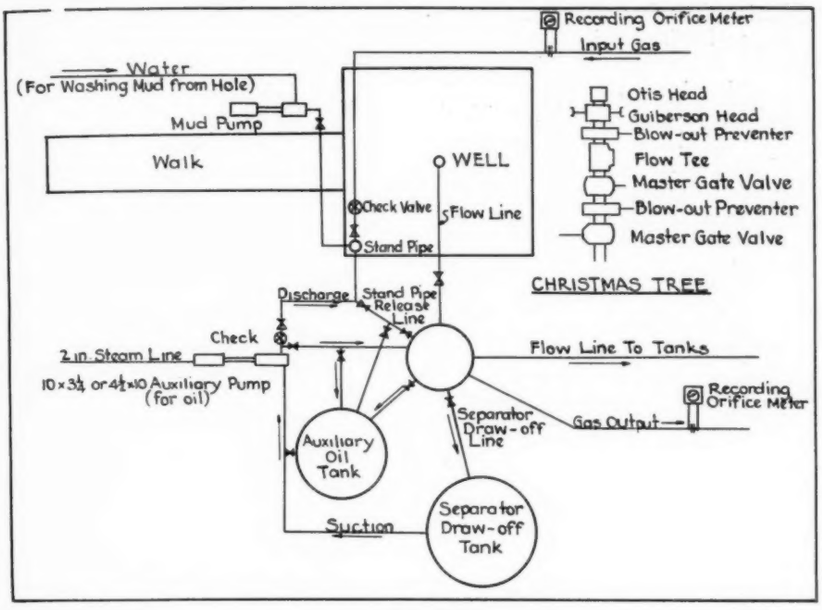


Diagram showing hook-up and connections used by one company in drilling-in under controlled pressure

By
K. C. SCLATER

Low Reservoir Pressure Has Led to Advanced Methods of Well Completion in Mansion Area

Drilling-in Wells in the Oklahoma City Field Under Controlled Pressure

METHODS of drilling-in and completing wells in the Mansion Area of the Oklahoma City pool have been influenced by pressure changes in the reservoir. When the south end of the pool was developed, the intial reservoir pressure was 2600 lb. per sq. inch. In December, 1935, when the discovery well in the Mansion Area was completed, the reservoir pressure was only 575 lb. per sq. inch.

At the depths wells had to be completed, this low reservoir pressure called for other than ordinary methods of drilling-in to avoid the hazard of mudding off the productive sand. In the first wells drilled in the Mansion Area, it was evident that mud-fluid, and even heavy oil, were unsuitable for circulation. These fluids, because of their density and resultant hydrostatic pressure they imposed at the bottom of the hole, penetrated the productive sand and interfered with the natural capacity of the well to produce; the well when completed would not flow naturally. In order to avoid impairment of wells in this manner, it became necessary to use a light circulating fluid composed of a mixture of gas and oil. Thus it has come about that all wells in the Mansion Area except the first few completed, have been drilled-in under controlled pressure.

By using a light drilling fluid composed of gas and oil, the pressure carried in the circulating system at the bottom of the hole is so controlled that it is less than the pressure in the producing formation, being so regulated that the well can produce freely during the entire operation of drilling-in.

General practice is to set 40 ft. of 20-in. casing, using 50 sacks of cement; 100 ft. of 13⅜-in. casing, using 750 sacks of cement; and an average of 6350 ft. of 9⅝-in. or 8⅝-in. casing on top of the sand, using 1500 sacks of cement. Some operators prefer to use 9⅝-in. casing rather than 8⅝-in. casing in order to obtain a greater advantage of the well's flowing capacity on a potential test.

Seven days is the minimum time required by state regulations for setting of cement on the oil string. While waiting for the cement to set, usually equipment and connections for controlled pressure drilling are installed and made all ready, so that drilling can be resumed without delay. A diagram of a typical hook-up is shown in the accompanying illustration on this page. As can be noted, provisions are made for pumping oil down the drill stem and also for injecting gas under pressure at the same time.

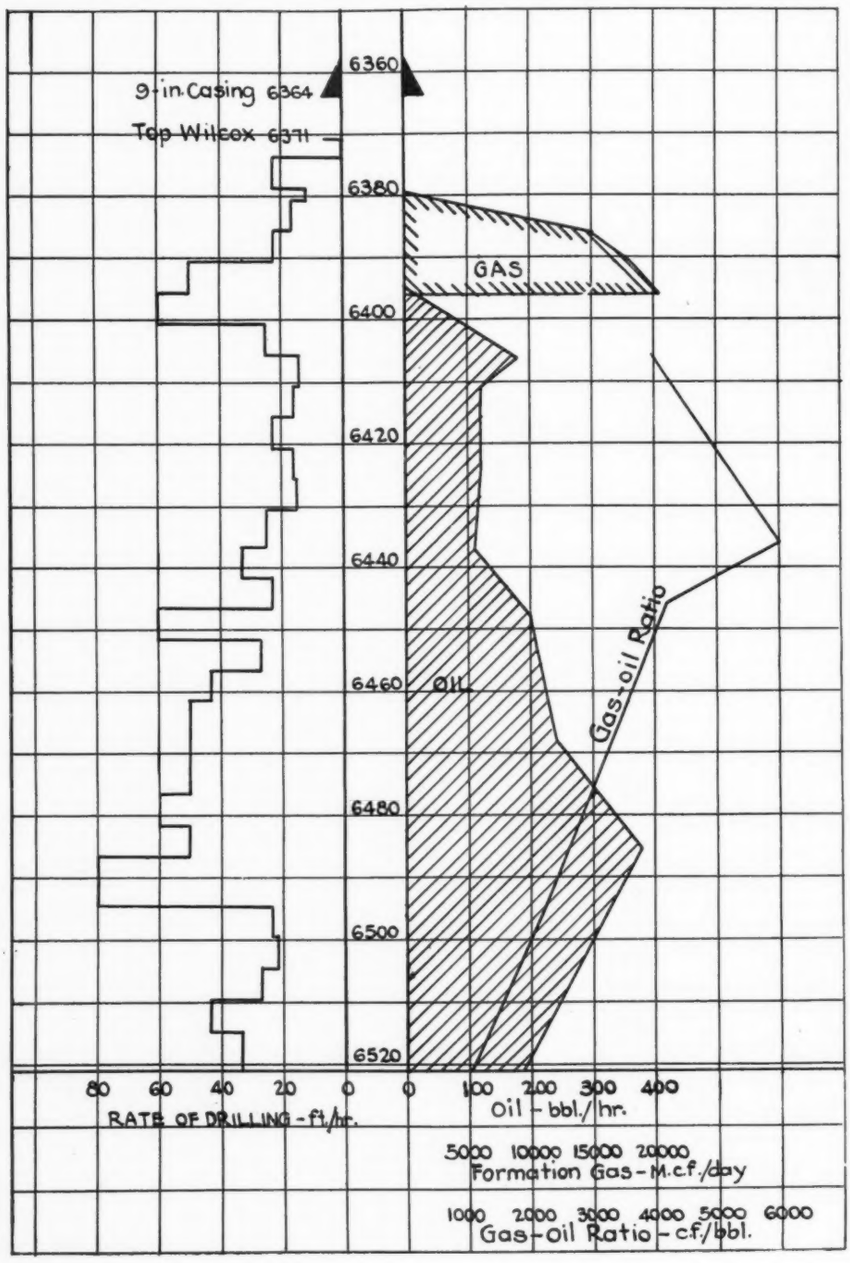
In drilling out the cement plug, mud-fluid or water is used for circulation; but after the plug is drilled the hole is cleaned entirely of drilling mud or water preparatory to drilling-in with oil and gas. The usual method of removing the mud-fluid is by injecting gas of about 300 lb. or more pressure down inside the drill pipe and flowing the drilling mud out in stages by gas-lift. The length of fluid column ejected at each stage depends on the pressure and quantity of gas available, but usually the first ejection is made with the bottom of the drill pipe 500 ft. from the surface. The drill pipe is then lowered another 500 ft. and the operation repeated, and so on to the bottom of the hole.

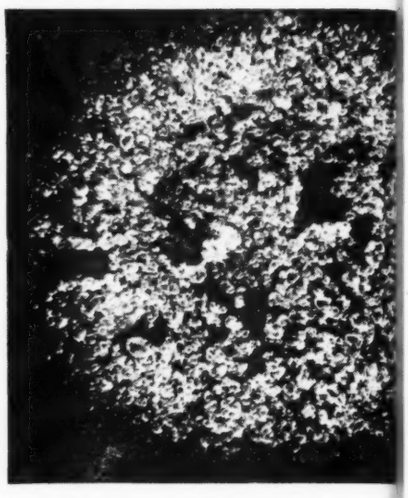
With the hole cleared of mud and water, drilling-in under controlled pressure is then begun and oil and gas are used as drilling fluid. The drill stem is packed off in the casing at the kelly, usually by means of an Otis pressure drilling head.

Gas at a minimum rate of two million cu. ft. a day and from 18 to 25 bbl. of oil are about the average quantities required for circulation to keep the hole clean and the bit lubricated when starting to drill-in. The actual quantities used will vary according to the well. As the sand is penetrated and the well begins producing gas and then oil, the quantities of gas and oil in the circulation system are adjusted accordingly. The extraneous gas usually is injected at a pressure of from 400 to

600 lb., depending on the size of drill pipe.

All input gas is measured by recording orifice meter and also the input oil accurately gauged. These quantities are deducted from the gas and oil coming from well, both of which are measured with the same accuracy and means as the input gas and oil. In addition to this information, the rate of drilling and the penetration are also taken. All these data are utilized in determining the well's productivity. The gas production, oil production, and gas-oil ratio are known for each foot of penetration. These data when plotted are valuable in correlating between wells and also for reference and guidance in producing the well. One method of plotting these data are shown on an accompanying illustration. The value attached to the curve showing the rate of drilling, it must be noted, should be governed by the care with which the well was drilled. Unless a uniform weight is carried on the bit and a uniform rotating speed are used throughout the period of drilling-in the curve has little or no value in conveying information regarding changes in the general character of the sand such as its relative hardness, softness, or the like. As was pointed out to the writer, there is also the question of the sharpness and type of bit used. To have any real value it appears that the curve should be supplemented at least by such information as weight on bit,





Top: Sample of cuttings—drilling-in with mud fluid and no pressure control

Lower: Sample of cuttings—drilling-in with formation fluids and pressure control

type of bit, condition of bit, and rotating speed. On several of such charts examined it was observed that when either gas or oil production increased, the rate of drilling increased; but there is no certitude that this was due to softening of the sand, though it may be interpreted as such. It may be the result, at least in part, of a more efficient removal of the cuttings when the production of the well increases, for observations do show that greater footage per hour can be drilled with controlled pressure than without.

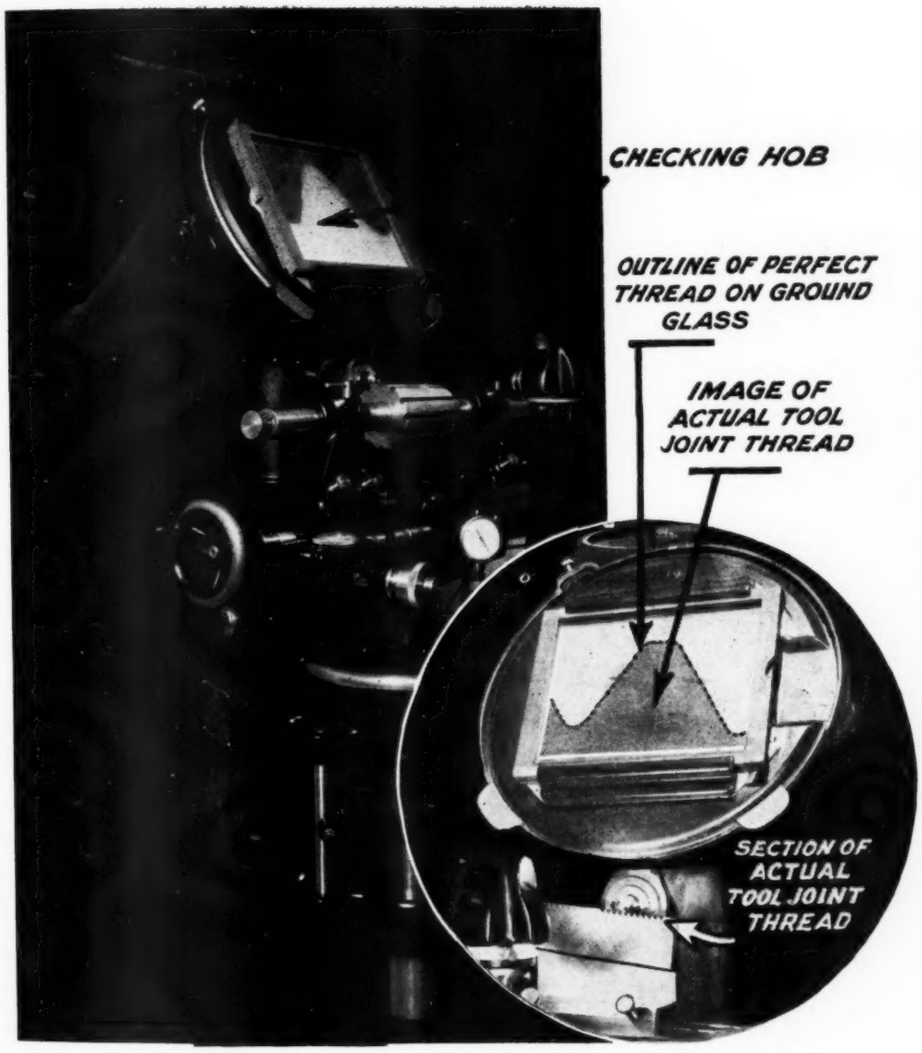
Samples of cuttings from a well drilled-in under controlled pressure with oil and gas are cleaner and much more satisfactory than those obtained from a well drilled-in with mud-fluid and without pressure control of the type discussed in this article. Evidence of this is found in the two accompanying photographs of samples taken in

At Left: One method of plotting data obtained while drilling-in under controlled pressure

ONE OF THE MANY REASONS FOR THE

UNIFORMITY OF

REED TOOL JOINTS


CHECKING HOB
OUTLINE OF PERFECT THREAD ON GROUND GLASS
IMAGE OF ACTUAL TOOL JOINT THREAD
SECTION OF ACTUAL TOOL JOINT THREAD

THE THREAD COMPARATOR and MEASURING MACHINE

•

The bottom photograph on the left shows a tool joint thread magnified 31.5 times, so that any irregularities may be checked against the outline of a perfect thread shown on the ground glass. The upper photograph shows a tool joint thread hob being checked in a similar manner. This method of checking assures UNIFORMITY OF THREAD STRUCTURE which, together with careful machining and heat treatment under rigid metallurgical control results in tool joints of . .

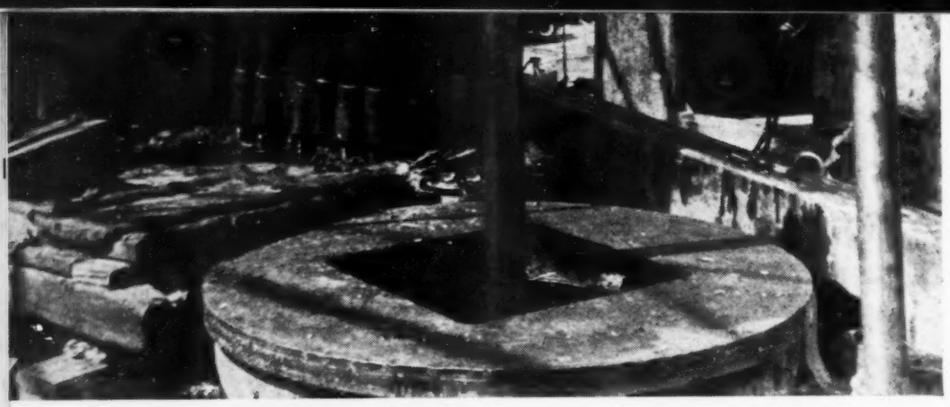
UNIFORMITY
DEPENDABILITY AND
ENDURANCE

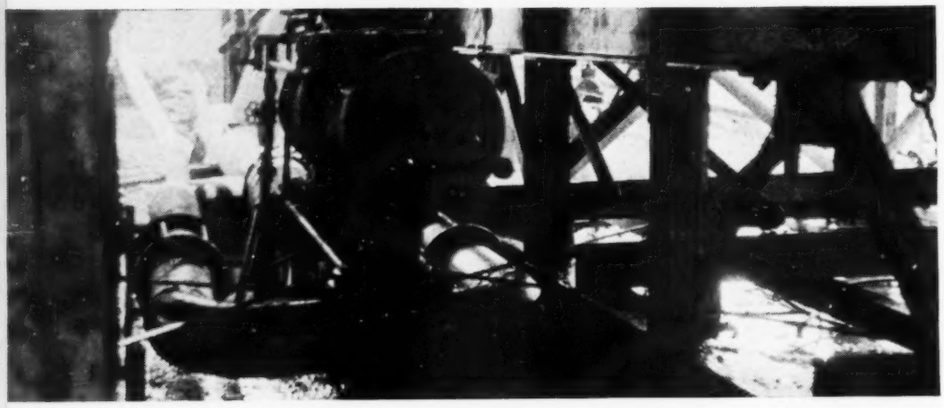
REED ROLLER BIT COMPANY

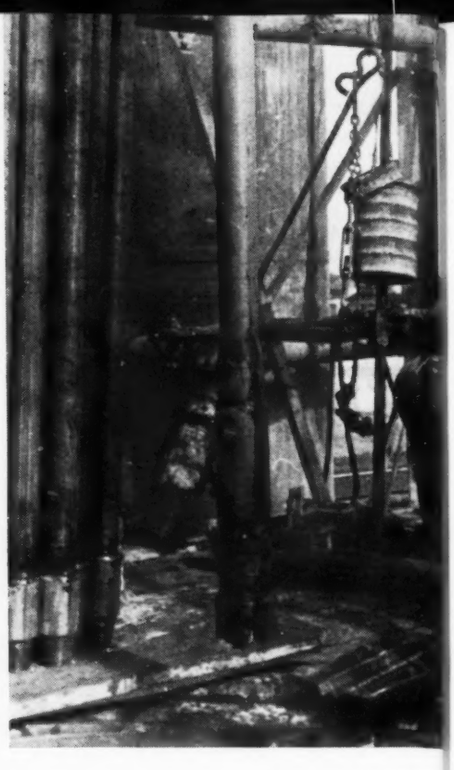
HOUSTON, TEXAS
OKLAHOMA CITY

LOS ANGELES

NEW YORK



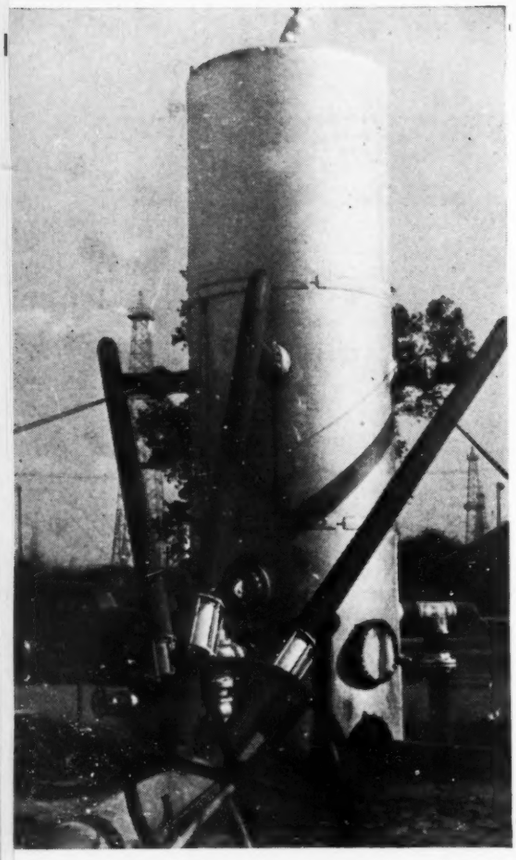


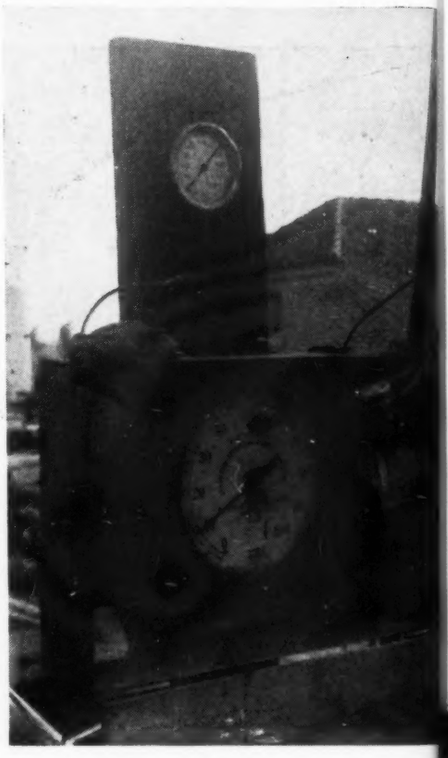


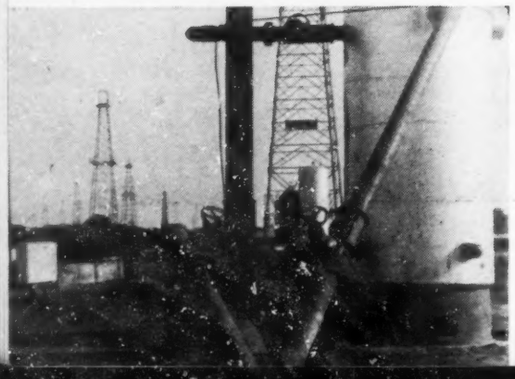
two adjacent wells in the Mansion Area where the sand, reservoir, and well conditions were similar. The sample taken from the well drilled in with mud-fluid and uncontrolled pressure was contaminated with numerous particles of shale quite large in comparison with the Wilcox sand grains in the sample.

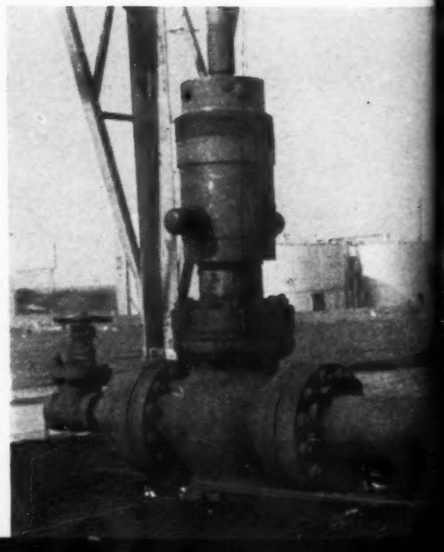
From two to five days are taken to drill-in the average well under controlled pressure. The average penetration in the Wilcox sand is 30 to 40 feet. When the total depth to be drilled is reached, the bit is kept on bottom for about two hours to insure thorough removal of all cuttings and a clean hole, thus the well is in condition to start producing as soon as the drill stem is removed from the hole. Washing-in is not necessary, so there is no anxiety regarding whether the sand is mudded off.

Experience with this method of drilling-in and completing wells in the Mansion Area has demonstrated its applicability in pools where the wells are deep and the reservoir pressure low.









Left—Top to Bottom: Well on production test with kelly packed off in casing—Cellar connections of well on test above—Flow lines into separator—Another flow line hook-up with provision for two separators

Right—Top to Bottom: Coring tool just removed from well in attempt to core producing sand under controlled pressure—Weight indicator used in coring, recorder not shown—Flow line take-off on completed well. Note metal grating covering concrete cellar

Engineering Skill Plays Important Role in Laying of Gas Pipe Line

By L. E. INGHAM, Superintendent of Transmission, Michigan Gas Transmission Corporation

Construction of 230-mile 22-in. line from Zionsville, Indiana, to Detroit, Michigan, accomplished in record time despite many obstacles. Seven multiple river crossings installed

River header and multiple lines

ARRANGEMENTS were completed late in August, 1935, for supplying natural gas to the Detroit City Gas Company at Detroit, Michigan, from the Texas and Kansas fields through the lines of the Panhandle Eastern Pipe Line Company and their connection at the Illinois-Indiana state line with the 20-in. line laid in 1931 by the Columbia Gas and Electric Corporation affiliates and through a lateral to be constructed.

Immediate steps were taken to determine a proper route for the lateral line to Detroit, and, after considerable investigation, it was determined to tie the proposed line into the 20-in. line at a point near Zionsville, Indiana, and construct the new line in as nearly a straight line as possible; its northern, or Detroit, terminus to be at the River Rouge plant of the Detroit City Gas Company.

As soon as the general route of the new line was determined upon, survey parties were placed in the field and right-of-way agents instructed to obtain the necessary permits from property owners to allow construction to proceed. This survey and right-of-way work proceeded throughout the winter.

Seamless steel pipe, 22-in. O. D., 5/16-in. wall thickness, weighing 72.38 lb. per ft., was specified for the main line. The multiple river crossings, of which there were seven, were constructed of 12¾-in. O.D., ½-in. wall, seamless steel pipe, weighing 65 lb. per ft., on that portion of the crossing where water will cover the line throughout the year. The section of river crossings not under water except at flood periods was constructed of 12¾-in. O.D., ⅜-in. wall, seamless steel pipe, weighing 49 lb. per foot.

Main line gates were placed approximately eight miles apart and are 22 in. by 16 in. Venturi-type Crane wedge disc valves. A 6-in. bypass was installed around each valve, consisting of pipe bends, flanges, and a 6-in. gate. The bypass gates were installed in such a manner that they can be operated easily from ground level. Six-inch blow-off connections were installed on each side of every valve.

The river crossing lines are controlled at each bank by 12-in. Crane steel gates. The four 12-in. river lines were connected into headers on either side of the river, the headers being placed so that the 12-in. gates always will be above high water level. The Mississinewa, Wabash, and St. Mary's rivers in Indiana, the Maumee and Tiffin rivers in Ohio, and the Raisin and Huron rivers in Michigan have multiple line crossings.

Due to the extremely level cultivated country through which the line passes, a great amount of drain tile was encountered. During the early stages of construction most of this farm drain tile was running full of water and caused construction difficulties. It being necessary to replace all tile damaged during construction, transite pipe 4 in., 5 in., 6 in., and 8 in. in diameter and 10 ft. to 13 ft. in length was utilized. By cutting off the proper length of transite pipe to cross the pipe line ditch, a first class tile repair job was

This shows a "rolling rig" for rolling the pipe while painting

Welding operations at a river crossing

accomplished without the use of the customary tile troughs. Transite pipe is a composition of asbestos and cement and can be cut with an ordinary hand saw.

The sections of the line in Indiana and Ohio were constructed by arc-welding two random 40-ft. lengths of pipe together and connecting these 80-ft. joints by means of a coupling of the Dresser or Dayton type. The line in Michigan is a coupled line and was constructed by installing the same type of mechanical coupler approximately every 40 ft., except where ditch or other construction conditions made it advisable to weld two or more 40-ft. joints together before connecting with a coupling.

Peat bogs, quicksand, caving clay, and free-running sand all tended to delay construction and added to the difficulties caused by a continuous three weeks' rain at the outset of the job. The peat bogs, while not generally of great dimensions, were rather numerous and, inasmuch as they would not support construction machinery, it was necessary to build corduroy roads along the right-of-way at these bogs and perform most of the work by hand. Heavy concrete anchors were installed at frequent intervals through these peat bogs. Considerable caving ditch was encountered at various points along the line. Part of this caving condition was due to running sand, part to quicksand, and part to a peculiar clay mixed soil that would not stand up behind a ditching machine. Frequently it was necessary to work from two to four clamshell excavators just ahead of the pipe laying crew in order to have a ditch suitable for construction purposes. The Bibb Contracting Company had 21 clamshells, the United Engineers and Constructors, nine, and they were in constant use.

Both contractors used No. 48 Buckeye ditching machines and kept six machines running day and night.

A soil survey by means of a soil rod, with check measurements by means of soil analysis and accelerated electrolytic tests, resulted in the conclusion that a protective pipe coating was advisable on approximately 190 miles of the line. This volume of pipe was supplied by the mill with a primer coat and in addition a coat of field prime was put on before the final coat of hot enamel was applied. The couplings were given a coating of coupling compound.

The greatest length of pipe laid and backfilled by any one crew in a day was 16,200 ft., although 12,000 ft. to 14,000 ft. per crew per day was not unusual. Both the Bibb company and the United engineers laid their first pipe on April 25th. The Bibb company completed laying their sections June 26th and the United engineers completed theirs on July 6th. This probably is record time for the laying of 230 miles of 22-in. pipe, and the installation of seven multiple river crossings.

Upon completion of construction, the entire line was subjected to a shut-in pressure test of 430 lb. for a period of three days. No readable pressure loss was found.

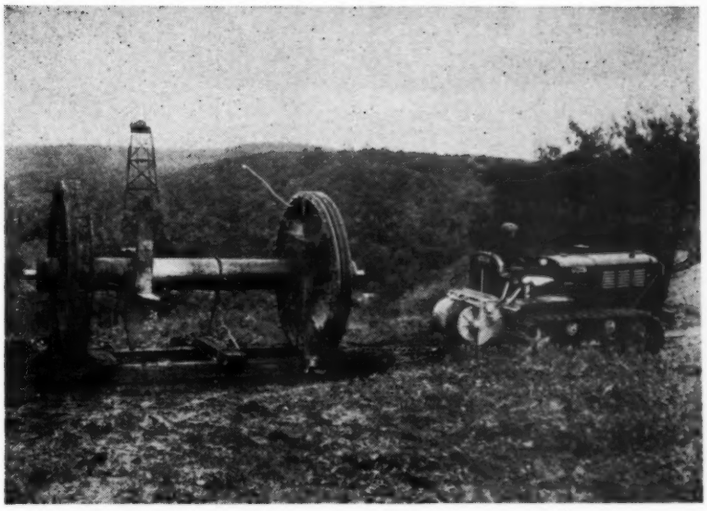
Gas was turned into the lines of the Detroit City Gas Company on July 7th and the Detroit company started natural gas service to a block of customers on July 9th.

For the purpose of awarding contracts, the line, approximately 230 miles in length, was divided into three sections. The southern section, extending from near Zionsville, Indiana, to a point near Bluffton, Indiana, covered approximately 87 miles. The central section began at the northern end of the southern section and extended to the Ohio-Michigan state line, a distance of approximately 88 miles. The northern section, of approximately 55 miles, extended from the Ohio-Michigan state line to the measuring station at the River Rouge plant of the Detroit City Gas Company. Contractors were permitted to submit bids on one or more sections.

The Bibb Contracting Company was the successful bidder on the southern and central sections. That company sublet the electric welding to H. C. Price, Inc., Bartlesville, Oklahoma, and the pipe stringing to C. Hobson Dunn, Dallas, Texas.

The contract for construction of the 55-mile section in Michigan was awarded to the United Engineers and Constructors, Inc., who likewise sublet the electric welding to H. C. Price, Inc. Stringing in Michigan was done by the Midwest Construction Company, Tulsa, Oklahoma.

A 22-in. gate setting. Such gates were placed every eight miles, with a 6-in. bypass around each. The latter is shown very clearly in the photograph



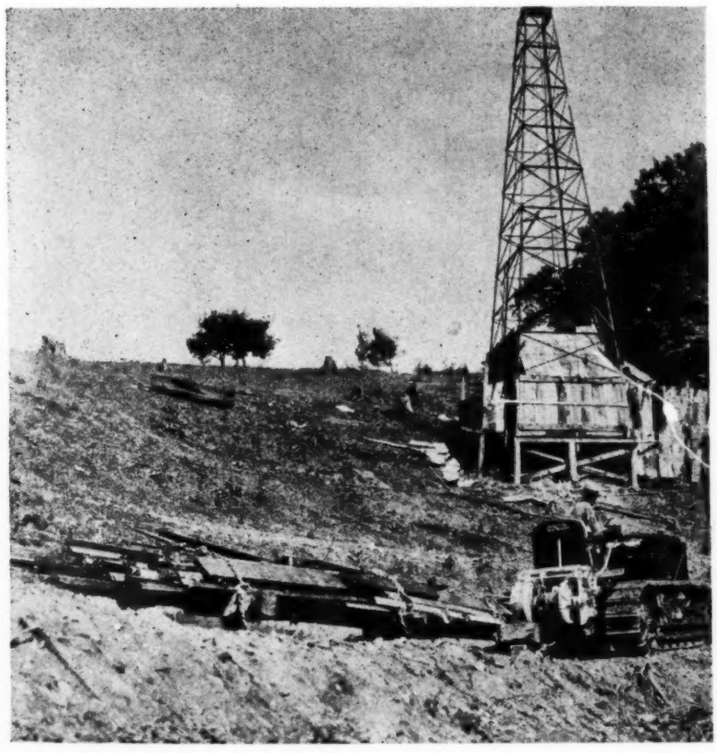
Tractor moving a bull wheel

Increased Use of Tractors and Modern Power Units in Eastern Oil Fields

INDUSTRIAL equipment, especially power units and tractors, are being used extensively in the important oil fields of southwestern New York (Allegheny field) and part of northern Pennsylvania (Bradford field).

Tractors in this difficult oil-field work are invariably equipped with winches, which serve effectively in the tight places when moving heavy equipment up and down steep mountain sides and also for pulling rods and tubing from wells or cleaning-out and pump repairs. The winches also are used when it is necessary to move parts of a rig an inch or two at a time, particularly in spotting accurately the engines for drilling rigs.

In addition to moving rigs from place to place and providing power for cleaning wells, tractors are used in moving stumps and boulders, building roads, grading camp and building sites, etc.

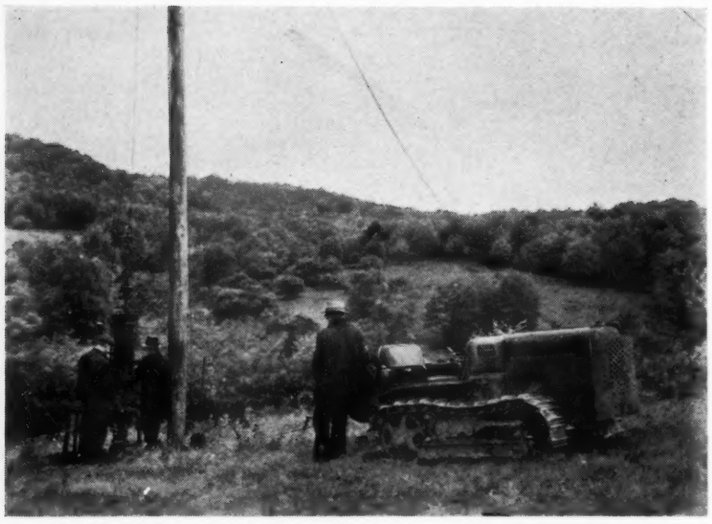


Part of a drilling rig on property of Bradley Producing Corporation near Wellsville, New York

Oil wells in these two fields are not nearly so deep as they are in the West, and accordingly permanent derricks are not required for later cleaning-out or pulling operations. A gin pole with suitable tackle and cable attached to the tractor winch is sufficient to pull sucker rods to get at the valves or when necessary to pull the tubing. One of the wells recently cleaned with a tractor is 1200 ft. deep and is near Wellsville, New York. It was operated by the Bradley Producing Corporation and was one of four such employed by this corporation. The well was equipped with 7/8-in. rods, 2-in. tubing, and 6¼-in. casing. The rods were pulled by means of a gin pole 45 ft. high held up by five guy lines.

On another property of this company near Wellsville on which a tractor was engaged in moving a drilling rig from one location to another, water-flooding is practiced. In water-flooding, each oil well is surrounded by pressure wells down which water is forced under pressures of 600 to 1000 lb. to increase the recovery of oil.

The property consists of 40 acres, much of it on a steep mountain side and at an altitude of around 2350 feet. It is laid out in rectangular tracts 349 ft. long (north and south) and 317 ft. wide (east and west). At each corner of each of these tracts a pressure well, and exactly in the middle of each of the plots an oil well, were being drilled. Thus, each oil well is sur-



Model T-20 TracTracTor providing power for pulling rods

rounded by four pressure wells. The wells were being drilled 1550 ft. deep. The power plant for pumping the wells and water plant for the pressure wells will be placed in the geographical center of the property. Harder & Mitchell were the drilling contractors on this project and were working five drilling rigs on the property at the time photographs were taken.

Temporary steel derricks are used to drill the wells, and as soon as a well is finished the rig is knocked down and moved to a new location on the steep mountain side by a wood sled, or boat, as shown in an accompanying illustration, and then quickly reconstructed. In some places where the movement of material, such as shown, is exceptionally steep and difficult, the tractor is chained to a big tree and then the load is eased up or down, as the case may be, by the winch.

For pumping many wells in the Bradford and Alleghany fields, industrial power units, are being used to a considerable extent.

In a typical central power plant operated by a power unit, the band wheel is 18 ft. in diameter and below it are two eccentrics placed 180 deg. apart to give a balanced load.

The manufacturers of such power equipment claim the new six-cylinder units promise to be especially effective for use in drilling wells because of their ability to operate efficiently for use in slower speeds required while drilling at greater depths and also because of the fast pulling-out speeds when changing bits and bailing. This flexibility of operation means much to the drilling contractor who usually is paid so much per foot drilled and likes to keep the bit on bottom as much as possible doing productive work, it is pointed out.

Recent Developments in the Polish Petroleum Industry

POLISH production of crude oil in the first four months of 1936 totaled 172,000 metric tons, as compared with 170,000 tons for the same period of 1935. Detailed refinery production figures comparing the four-months periods for 1935 and 1936 are as follows:

Item	Jan.-April 1935 (Metric Tons)	Jan.-April 1936 (Metric Tons)
Gasoline	28,000	30,000
Kerosene	49,000	47,000
Gas oil	30,000	26,000
Lubricating oils	25,000	27,000
Paraffin	9,000	9,000
Other products	13,000	13,000
Total	154,000	152,000

Petroleum products stocks on April 30, 1936, amounted to 180,500 metric tons against 178,670 tons on December 31, 1935. Stocks of crude oil on April 30, 1936, aggregated 35,120 metric tons, as compared with 21,100 tons at the end of the preceding year, an increase of 70 percent.

Twenty-four refineries were in operation during the period under review (26 in December), employing 3,106 men (3,219 in December). A total of 762 crude oil and natural gas wells were producing as against 755 in December, employing 9,060 men (9,113 in December). Fifty-five new drilling operations were begun during the period under review. The price of crude oil remained unchanged at 135 zlotys ($25) per metric ton.

Domestic sales of petroleum products during the first four months of 1936 showed an advance of 10 percent over the same period of the preceding year, as evidenced by the following figures in metric tons:

Item	Jan.-April 1935	Jan.-April 1936
Gasoline	17,000	17,000
Kerosene	41,000	44,000
Gas oil	17,000	19,000
Lubricating oils	12,000	13,000
Paraffin	2,000	3,000
Total	89,000	96,000

Export of petroleum products showed a marked improvement over those of the first four months of 1935, aggregating in metric tons:

Item	Jan.-April 1936
Gasoline	16,800
Kerosene	9,700
Gas oil	7,600
Lubricating oils	9,150
Paraffin	5,100
Other products	1,200
Total	49,550

The chief countries of destination of Polish exports of petroleum products were: Czechoslovakia, Switzerland, Austria, Germany, and the Free City of Danzig. Some bunker deliveries at Gdynia also were made. All the above foreign markets were more receptive than during the same period of the preceding year, the most pronounced advances being recorded in the case of Czechoslovakia and Germany. Exports for the period under review constituted approximately 34 percent of the total sales, and 33 percent of production.

The Polish Government requires all producers and refiners to export a certain percentage of their total production. Inasmuch as the cost of production and manufacture is greater in Poland than in other producing countries, the Polish companies are compelled to take a heavy loss on all of their exports.

Natural gas production for the first four months of 1936 showed a decline of six percent as compared with the same period of the preceding year, the figures being 166 and 176 millions of cubic meters. The price of natural gas is at present 4.29 zlotys ($0.81) per cubic meter.

In oil production, Poland, the Soviet Union, and Rumania are the three largest producers in Europe.

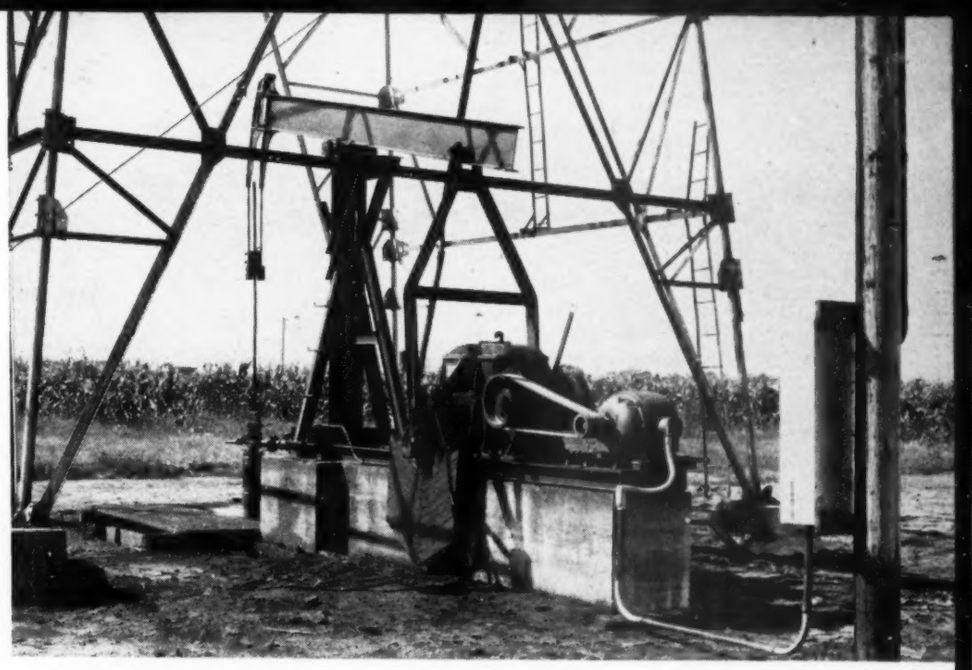


Fig. 1. Electrically-driven pumping unit on Dickey Oil Company No. 1 Alva Cook, Robbins Pool

By
G. H. WECKEL*
and
R. E. PATRICK*

Pumping With Electric Power in Robbins Pool, Kansas

In this article the authors discuss the flexibility and economy of purchased electric power as employed with modern equipment in the Robbins pool, Kansas, where changes in method of applying power by multiple well hook-ups are adopted as an economic measure to meet the declining productivity of the wells.

THE Robbins Pool, three and one-half miles south of Wichita, Kansas, was discovered in 1929 by the Shell Petroleum Corporation and E. B. Shawver at well No. 1 Robbins. Immediately following the discovery, eight other producing wells were drilled by these operators and three other oil companies, establishing a pool one location in width east and west and approximately four locations in length north and south. Following the drilling of these producers two dry holes were drilled on the south end and one on the east edge of the pool, causing activity to cease until May, 1934, when E. B. Shawver drilled in No. 1 Brookings a half mile north of production. This well, with an initial potential of 400 bbl. per day on natural flow, immediately revived interest and activity to the extent that the field now contains 55 wells. The north and west limits of the field are now definitely defined by dry holes following development covering an area of approximately one square mile.

Activity during the latter stages of the development was confined to five operating companies. All but one have adopted electric-motor-driven geared pumping units and are using purchased electric power. Of the 46 new wells in the field, 38, or 83 percent, are pumped with electric power. The application of electric power to pumping wells has been made easier since the development of highly efficient reduction units and portable pulling machines for servicing wells. These features have made it possible to use constant speed, more efficient motors with simplified control equipment designed for pumping duty only. The old two-speed double-rated oil well motor with its complicated control equipment necessarily sacrificed pumping efficiency for the advantage of well-servicing, such as pulling rods, pulling tubing, and cleaning out with the same equipment.

Three of the operators have standardized on constant speed triple-rated 9/16/25-hp. 440-volt motors, either 1200 or 1800 r.p.m. no-load speed. Power is transmitted from the motor to the pumping unit by means of V belts. Two sheaves are provided for each motor, one for speeding the well up when taking potential and one calculated to give a slow pumping speed

*Kansas Gas and Electric Co., Wichita, Kansas.

Fig. 2. One unit pumping four wells. This 4-well hook-up is in the Robbins Pool, Kansas.

so that the allowable production will be obtained by operating as near 24 hours each day as possible. Tests have proven that the most economical operation from a power standpoint is obtained with a long stroke and slow speed rather than a short stroke and high speed. Besides changing motor sheaves, requiring only a few minutes, variations in production also can be obtained by shifting the pin to any one of the holes in a five-hole or six-hole crank. A typical individual unit installation is shown in Fig. 1.

The average well depth is 3100 feet. Initial well potentials varied from 100 to 900 bbl. per day. When taking potential on the larger wells the motors are operated on the 25-hp. rating. For the normal operation of pumping the allowable, all the wells are able to operate on the 9-hp. rating. This arrangement makes it possible to keep the motors operating at high efficiency at all loads.

At the present time production from most of the wells in the pool has declined to a small percentage of the initial potentials. As a result some of the operators have been actively taking advantage of their flexible pumping equipment by devising methods of combining wells on shackle rod hook-ups where from two to four wells can be pumped by one geared unit and motor, thereby releasing equipment for use in other areas, and at the same time effecting a large saving in power lifting cost.

Four-Well Hook-up

The Dickey Oil Company, Wichita, Kansas, on one of their leases originally installed four individual pumping units equipped with 9/16/25-hp. motors. When the total production on these four wells declined to where they were pumping only 80 bbl. of oil and 50 bbl. of water per day, a change in operation was worked out by the production department of the company that resulted in more efficient use of both their equipment on the lease and the electric power purchased. Three of the individual pumping units were removed and these three wells were connected by three shackle rods to the pumping unit on the fourth well. Fig. 2 is a close-up view of the pumping unit showing the method employed in connecting the four wells. It will be noted that the beam connection is made with a hook and link that runs through an old piece of 8-in. casing, which acts as a knock-off post and guard. Two sprockets with sleeve bearings are mounted on two short pieces of 8-in. I-beam, which in turn are bolted to the cement base. A double chain is used to make the connection between the shackle rod and knock-off link. The wish-bone connection from the stroke posts to the wrist pin is made of 4-in. channel iron. This connection has a great advantage in that it gives an even pull on the bearings in the gear box; another advantage is that it eliminates a great deal of vibration at higher speeds. This arrangement of pumping has proven very satisfactory, and the company is working on two other such installations on adjoining leases. Fig. 3 is a sketch showing the location of the well, length of shackle rods, and other well information.

Fig. 3. Diagram of 4-well hook-up referred to in Fig. 2

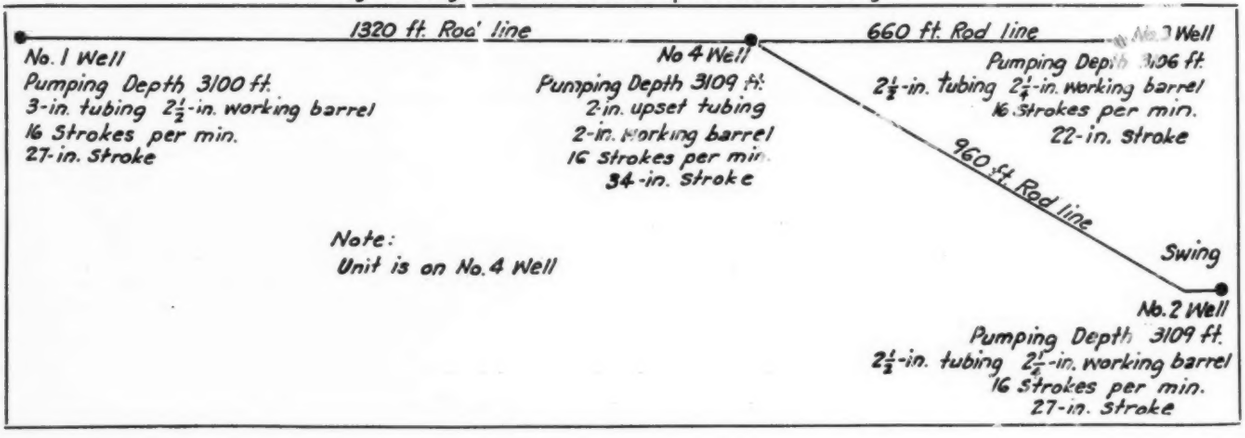


Fig. 4. Rod line support used by one company in the Robbins Pool

Fig. 4 shows a new type shackle rod support that was designed by one of the men on the lease. This support does not require any grease or attention whatsoever. The one shown in Fig. 4 has been in use for about eight months, operating in several rain- and sand-storms and the wearing surface has now become so smooth and polished that it rolls easily on the carriage. Every other standard is equipped with this type rod support.

All this equipment was designed and made on the lease except for the stroke posts, bearings, and shackle rod supports, the latter being cast in a local foundry. The equipment was made and installed at a very small cost.

This four-well hook-up requires only 9.4 hp. to operate, with a monthly production of 3900 bbl. of fluid. The purchased power amounts to $55.56, making an average cost of only $13.89 per well per month or an average lifting cost of 1.42 cents per bbl. of fluid.

For approximately eight months this unit, with electric motor drive, has been in service and up to the present time no maintenance has been required. This company is installing two more units of the same type and these will release the individual pumping units for use on some new leases that are being developed.

Two-Well Hook-up

Fig. 5 shows a two-well hook-up that was made and installed by the Dickey Oil Company. It is one of the smoothest running and the best balanced two-well hook-ups in the field. These wells are pumping from a depth of 3116 ft., 16 strokes per minute, with a 32-in. stroke on the pumping unit and 17-in. stroke on the jack well. The two wells are producing a total of 27 bbl. oil and 123 bbl. of water per day through 2-in. tubing. The measured hp. on this unit is 4.69 with a total operating cost of $34.44 per month or a lifting cost of .765 cents per bbl. of fluid. The construction of this unit is such that it practically eliminates any increased strain or load on the beam or bearings and can be operated satisfactorily at speeds up to 25 strokes per minute.

This method of connecting several wells to one pumping unit is very well adapted to producing wells of this type due to the low cost of equipment and the low operating cost, and should lead to a wider use of hook-ups of this kind on leases having a low settled production. It is low first cost, low maintenance expense, flexibility (not only in operation but also in changing from individual units to two-well and four-well combinations), ease of salvage, and high salvage value of electrical equipment (combined with the advantages of purchased electric power), that have contributed toward justifying this method of operation in the Robbins Pool.

Fig. 5. Two-well hook-up, Robbins Pool, Kansas

Protecting Oil Sands by Directional Drilling

By

ALEXANDER ANDERSON*
and T. K. SAWYER**

How the problem of protecting two productive oil sands in a well from an intermediate high-pressure water was successfully solved

A SIDETRACKED open hole in which two oil sands were exposed to water from a high-pressure intermediate sand is the unusual condition that has offered another type of problem for solution by directional drilling. Under ordinary circumstances, new hole could readily be drilled and the section of sidetracked hole left undisturbed; but when such a section, plugged off at the top by cement, formed an unobstructed passageway for high-pressure water to damage the productive sands, protection of the oil zones required re-entry into the original hole so that the water sand could be cemented off.

During the drilling of a well in the Edison field, California, a 10⅝-in. hole was drilled through the Kern River sand at about 1750 ft. and into a newly discovered oil sand at a depth of approximately 2700 feet. Between these two productive zones a high-pressure water sand was passed through; so it was decided to set 8⅝-in. casing above the Kern River sand and cement blank liner opposite the intermediate water sand.

A cement bridge of about 100 ft. in length was placed in the hole to extend above the top of the Kern River sand to where the casing was to set. The 8⅝-in. string was then cemented on top of this bridge. After making a water shut-off test and drilling ahead with a 7⅞-in. bit, however, the cement bridge below the casing acted as a whipstock and diverted the hole to such an extent that the originally drilled 10⅝-in. hole was completely sidetracked for a distance of about 200 feet.

The new hole was plugged with cement to a point near the base of the original cement bridge and the hole was then in the condition shown in Fig. 1. From the illustration it clearly can be seen the high-pressure water had free access both to the Kern River sand above and to the new oil sand below; and that the sidetracked section of hole could not be left in such condition without damage being done to the two productive zones. It was therefore decided to use deflecting tools to direct a new hole into the old one and thus provide a means of shutting off the water sand.

The deflecting tool used for the purpose was the Lewis knuckle joint, the general operation of which is shown in Fig. 2. Referring to this illustration, the knuckle joint is oriented into the well so that it will divert the hole in any predetermined direction when it rests on bottom as in "A." With the tool in this position, a universal joint through which it is rotated by the drill pipe allows it to maintain the direction in which it is set while making hole. The rotary table is first eased around for several revolutions, care being taken that the weight is maintained at the desired amount and that the circulation is steady. Drilling is then continued at a speed of from 10 to 20 r.p.m.

As drilling progresses, the knuckle straightens up and the double of small diameter drill pipe, which is run above the knuckle joint, takes care of the necessary curvature for continuing the hole in the new direction as shown at "B." With the knuckle joint the hole, enlarged by a reamer above the bit, is drilled for about 20 ft., as at "C." The tools are then pulled and a single-shot reading is taken to measure the inclination and direction of the new hole. With the course found as desired, a follow-up bit is run on the same double to make another 20 ft.

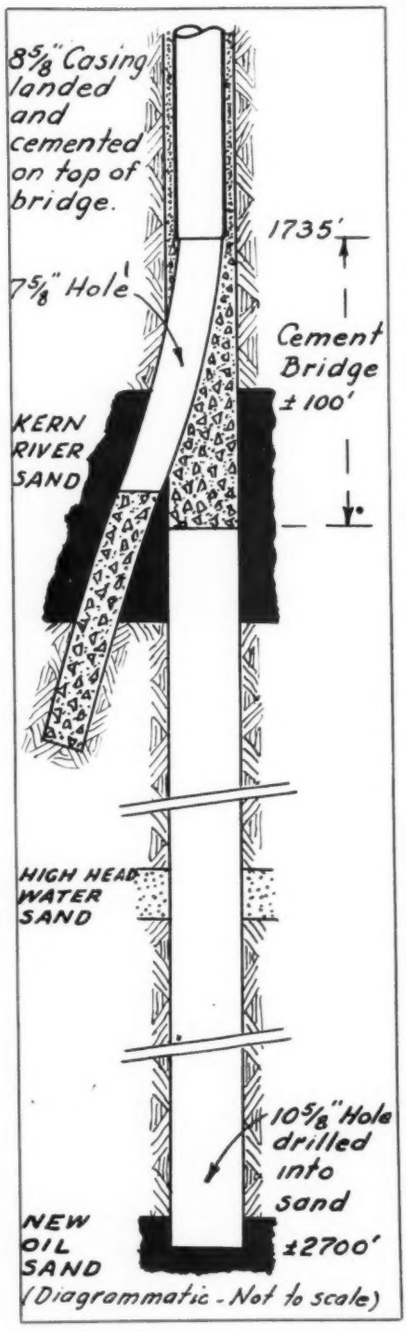


Fig. 1. Shows the well before running the knuckle joint. Water under high-pressure from the water sand had free access to the two oil sands

*President of Alexander Anderson, Inc., oil well surveying and direction control of drilling wells.
**Petroleum Engineer, Alexander Anderson, Inc.

of small hole (as shown in "D") and the hole again checked for inclination and direction. The hole is then enlarged to full size with a pilot reamer bit as shown in "E."

The first deflection made with the knuckle joint followed down the side of the plug placed in the 7⅞-in. hole drilled after the casing was cemented and put that hole in condition to deflect it back into the original 10⅝-in. hole. The details of subsequent operations are shown diagrammatically in Fig. 3.

The knuckle joint hole that followed the cement plug was continued to a depth of 1893 feet. Since 8⅝-in. casing was cemented above, it was necessary to underream in order to enlarge the hole to 10⅝-in. diameter. The hole was therefore underreamed to 1893 ft., where a good formation shoulder was thus provided for the next deflection.

After measuring the inclination and direction with our photo-record single-shot survey instrument at this point, a knuckle joint was oriented into the hole and during the run then made the new hole was definitely deflected back toward the original hole. The follow-up hole continued on the new course to 1971 ft. and was then underreamed and a survey reading of direction and inclination taken. Calculations were made and the computations showed that the bottom of the new hole was only two ft. from the wall of the original hole. This position was also below and to the left of the old 10⅝-in. hole and made an ideal set-up for the last deflection. The knuckle joint was therefore set for the required inclination and direction to make the necessary change to the right.

After drilling 11 ft. with the knuckle joint, the new hole broke into the original hole. This re-entry was far enough above the high-pressure water sand so that a liner with a blank section set opposite the source of water could be run and the water sand cemented off. Had the new hole not broken through into the old so high, it might have been necessary to plug back and start over again because the new hole was very close to the water horizon when the holes joined.

During the entire time drilling by directional control was in progress, a peg and string model was used to show the positions of the original and the new hole to scale in all three dimensions. This facilitated the work to a considerable extent by making it possible to determine the distance between the holes and the direction of the deflected courses with a scale and protractor.

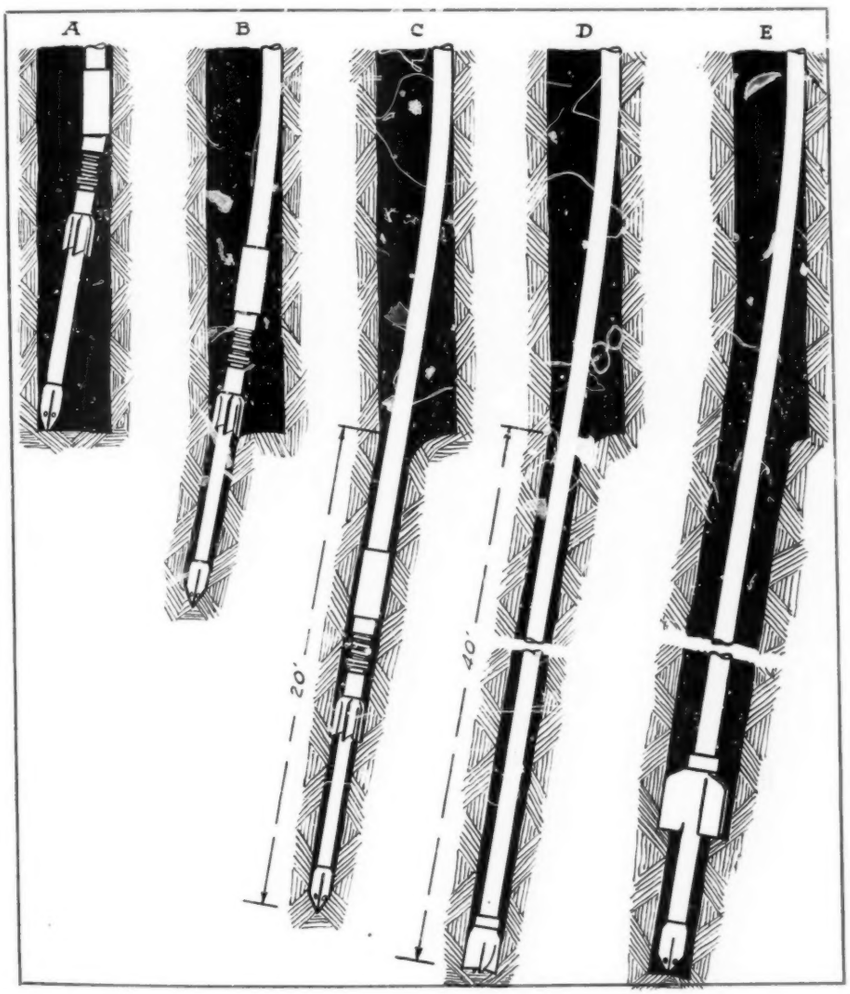


Fig. 2. Method of deflecting the hole with the Lewis knuckle joint

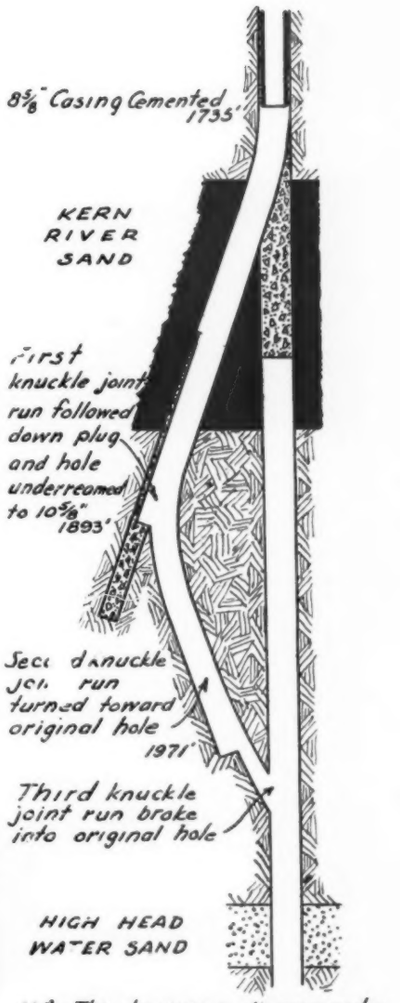

8⅝" Casing Cemented 1735'
KERN RIVER SAND
First knuckle joint run followed down plug and hole underreamed to 10⅝" 1893'
Second knuckle joint run turned toward original hole
1971'
Third knuckle joint run broke into original hole
HIGH HEAD WATER SAND
N.B - This drawing is diagrammatic. Actual deflections provide curves through which pipe is readily run.

Fig. 3. Here shown in detail are the deflections used to make the new hole break into the original hole above the water sand

Rerunning Acid-Treated Cracked Naphthas Over Alkalies

By GEORGE M. WOODS

Reducing the quantity of acid and rerunning over alkali solution were found to produce an overhead product of better color

IN acid-treating cracked naphthas a certain volume of dialkyl sulphates is formed. These compounds are insoluble in caustic and water and remain in the acid-treated naphtha after it has been neutralized. These dialkyl sulphates, however, are soluble in strong sulphuric acid, and if the cracked naphtha is treated with enough acid they are almost completely removed from the naphtha layer. These dialkyl sulphates in the cracked gasoline break down when heated to around 280-300 deg. fahr., and at somewhat lower temperatures in the presence of steam, forming sulphur dioxide and peroxides. The chemical equation for this breaking down process is:

$$R'O\diagdown\!\diagup O \quad \xrightarrow[(280\text{-}300^\circ F.)]{\text{Heat}} \quad R'O \quad + SO_2$$
$$\quad\; S \qquad\qquad\qquad\quad | \qquad\;$$
$$RO\diagup\!\diagdown O \qquad\qquad\qquad\quad RO$$

R and R′ represent alkyl radicals. The sulphur dioxide liberated goes into the still fractionating tower with the hot naphtha vapors where it reacts with and darkens the naphtha overhead, causing the condensed naphtha to be yellow and unstable. The peroxides usually condense among themselves and stay in the bottom of the still because of their high boiling points, where they cause very little trouble. The volume of dialkyl sulphates formed in a cracked naphtha during the acid-treating process depends upon the severity of the cracking operation, the stock, the amount and strength of the acid treat, the treating temperature, the length of time the acid is in contact with the naphtha, the agitation, etc.

It has been found that if, in rerunning acid-treated cracked naphtha, sufficient caustic or soda is added to the still along with the oil charge to neutralize completely all the sulphur dioxide formed from the breaking down of the dialkyl sulphates, a much better product is obtained, and also that much less acid can be used in the acid-treating process for the production of good color and color-stable finished gasolines. Other alkaline substances also have been found suitable; ammonia, however, being an exception. Ammonia will do some good, but other alkalies have been found to give better results. A specific example of the effect of rerunning cracked acid-treated naphtha over caustic in a refinery processing approximately 7000 bbl. of cracked naphtha per day will be given.

The refinery under discussion cracks its naphtha in a unit designed by the operating personnel, and originally gave the cracked product an acid treat of 12 lb. of 98 percent sulphuric acid per bbl. of oil in a continuous-treating unit. The acid-treated naphtha is then given a water and caustic wash and stored from one to ten days before rerunning with fire and steam to a low percent of bottoms. Several times it was attempted to lower the acid treat but each time this was tried the overhead naphtha from the rerunning operation lost color. Thus, when treating with 15 lb. of sulphuric acid per bbl. the rerun overhead was 27-30 Saybolt color, with 12 lb. of acid 23-27 color, with ten lb., 18-21 color, and with six lb., 12-15 color. Samples of these cracked acid-treated and neutralized naphthas were obtained and rerun in the laboratory in a small iron still, using fire and steam. The colors of the overhead products checked with those produced in plant operation very closely. These distillations were repeated except that various amounts of a 40-deg. Baumé solution of sodium hydroxide was added to the charge stock before the distillation. The Saybolt colors on the overhead products from the various distillations are given in Table 1. All distillations were made to six percent bottoms.

TABLE 1

Acid Treat, Lb. per bbl.	Caustic Solution Added, CC. per gal.	Color, Saybolt
15	0	27
15	1	30
15	2	30
12	0	25
12	1	25
12	2	27
12	4	29
12	8	30
12	16	30
10	0	20
10	1	19
10	2	20
10	4	25
10	8	30
10	16	30
6	0	14
6	1	16
6	2	17
6	4	24
6	8	29
6	16	30

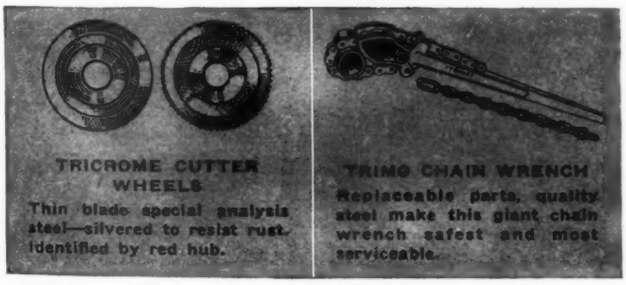
As may be seen from a study of the data in Table 1, acid-treating with six lb. per bbl. of oil and rerunning over eight cc. of caustic solution per gal. produced a better colored overhead product than acid-treating with 12 lb. of acid per bbl. of oil and rerunning without caustic. The possible chemical savings per day indicated by treating with six lb. of acid and rerunning with caustic over treating with 12 lb. of acid per bbl. amounted to some $330 and so was tried out in the plant. The plant results closely checked the laboratory results, and the acid treat has been further reduced to two lb. of 98 percent acid per bbl. of oil. The caustic consumption also has been further reduced until the sediment on the cracked naphtha rerun bottoms is approximately as low as originally. No trouble from caustic embrittlement of the still bottoms has been observed as a result of introducing the caustic into the hot stills.

IN TIGHT SPOTS

TRIMO'S the wrench to use in the tight spots—when men's safety and company profits may depend on the way a pipe wrench takes hold.

TRIMO grips hard—on any job. Made throughout of Chrome Molybdenum Nickel Alloy Steel. TRIMO is the most durable pipe wrench known. Handle is drop forged steel.

Look for the Red Tag—attached to every TRIMO—identifying the safest, strongest, most economical Pipe Wrench offered in the oil fields.



TRICROME CUTTER WHEELS
Thin blade special analysis steel—silvered to resist rust. Identified by red hub.

TRIMO CHAIN WRENCH
Replaceable parts, quality steel make this giant chain wrench safest and most serviceable.

TRIMONT MFG. CO., INC.
ROXBURY (BOSTON), MASS.

Present Status and Future Possibilities of Acid Treatment in Illinois Fields*

By FREDERICK SQUIRES[1]

EVERY successful method of increasing oil production has been simple enough to be described in a single word; shooting, suction, repressuring, flooding. The last word is acidizing. It is, of course, useful only on limestone or on a sufficiently limey sandstone.

Many years ago I saw acid treatment of shallow wells in Ohio. Lately I have seen treatments in Michigan, Indiana, and Kentucky, as well as several in Illinois. By general report the method is successful. Illinois producers should be provided with accurate findings as to the actual total results of acid treatment on the various lime formations.

Of the several lime pools in Illinois the general belief is that the McClosky makes a generous response and shows a profit over the cost. It is as generally believed, however, that the Trenton, Westfield lime, Martinsville, and Niagaran are questionable and usually do not pay out the cost of acidizing. Instead of a hazy impression from hearsay like this the producer should have accurate information based on pipeline runs covering the entire period from treatment to the time the increase has disappeared. This is the most important line of research for acidizing.

The process is so young and the general results have been so important that the people most interested have been too busy with the actual work of supplying, buying, and applying acid to devote much time to finding out what actually happens in a lime formation when acid enters it. But its very success makes acidizing worth research along the lines of (1) the limits of its successful application to rocks partly sand and partly lime, (2) improvement of the technique of application, (3) other oil field uses of acid, and (4) the actual effects of acid on the oil-producing lime.

There is little information about Illinois sands and limes from cores and not much more can be expected in a field where new wells in old pools are not likely to pay out. Helpful information could be obtained at small expense from sidewall cores from old wells were a simple tool available for obtaining them. Such cores would give information about the proportions of sand to lime and determine whether or not acid treatment would be useful and would give information as to porosity and permeability, which would determine the pressure required on the acid. It may be remarked here that had records been kept as to the sand thickness and the time and pressures required to force given quantities of acid into each of the wells treated, a good idea of the relative permeability of the lime around them could have been obtained.

Heat and agitation increase the speed of chemical action. It would be interesting to find out how beneficial heat would be in acid treatment and how much it would lessen the value of the inhibitor. Heating would be easy in the oil field where every tank is provided with adequate heating means with the use of which every pumper is familiar.

Agitation of the heated acid in the hole by mechanical means operated from the surface would be simple as also would be mechanical means of reaming the acid-softened limestone.

The effect of acid on McClosky wells at the edges of the well-known water floods is a promising study. The use of acid as an aid in fishing for tools lost in lime formations is too obvious to need any research. However, the softening of lime formations before rotary drills and even cable tools might be advantageous and is apt to pay if the quantities of acid required are not too great.

The use of an acid jet through a rotary drill to accomplish horizontal or inclined drilling in the producing formation of an old well is in the realms of possibility. The work to be done when drilling into an acid-softened lime is very little. Electric motors operating near the bottoms of wells to actuate pumping devices are now in successful use and the same kind of power could be applied to operate the rotary drill.

In present practice acid is driven into the oil-producing lime with pressure obtained by pumping more oil into a full hole. The same result can be obtained by putting a pressure on top of the acid with gas, delivered by compressors from gasoline or repressuring plants that are often available near lime production, especially in McClosky areas, or by portable compressors. Gas pressure would have advantages. Probably it would force acid farther into the lime and would bring oil back with it when released.

Opinions vary radically as to what happens in oil-bearing limestone when acid is forced against it or into it in through an oil well. One technician who has conducted many laboratory tests contends that the only result of acidizing is an enlargement of the well bore, with a lessening rather than an increasing of the permeability of the surrounding limestone, due to undis-

*Presented at the Fourth Annual Mineral Industries Conference of Illinois, Urbana, Illinois, April 24-25, 1936.

[1]Formerly Associate Petroleum Engineer, Illinois State Geological Survey, Urbana.

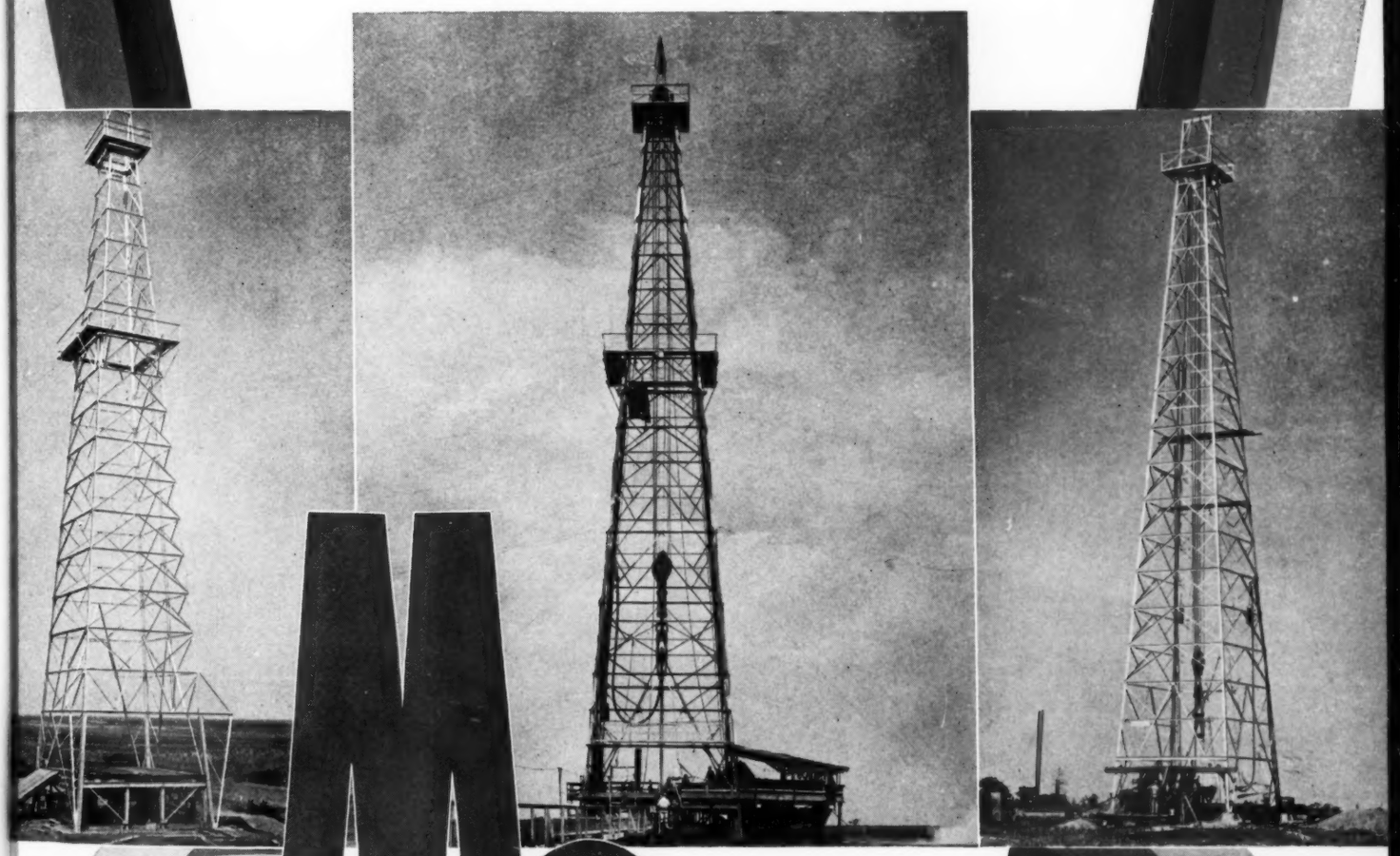
STEEL DERRICKS SINCE 1908

. . . . Moore, a pioneer in steel derrick construction, has continued to lead in the progressive development of derricks and equipment to meet the ever-changing requirements of a dynamic industry.

LEE C. MOORE & CO., INC. • PITTSBURGH • TULSA

Member Steel Derrick Manufacturers Association

Corpus Christi • Dallas • Houston • Henderson • Kilgore • Longview • Midland • Odessa • Pampa
Wichita Falls, Texas • Chase • McPherson • Russell • Wichita, Kansas • Stocks in all active fields



DERRICKS
PUMPING EQUIPMENT
Moore

solved particles of impurities driven into the limestone pores by spent acid under pressure. I have heard acid operators claim that acid entering one well increased the production of wells a full location away. These two schools of thought are more than 400 ft. apart. There is a comparatively inexpensive way to settle this contention.

At Anna, Illinois, is a quarry that operates on the same limestone as is productive and successfully acidized in Lawrence County, the McClosky in the top of the Ste. Genevieve.

The McClosky occurs in the upper 36 ft. of the quarry although limestone is taken out to about 90 feet.

An experiment could be tried as follows: Three bores 20 ft. apart could be made through the McClosky with the drilling rig now at the quarry. The center well would be core-drilled. A rufflle could then be cemented in the top of the center well and a standard-sized treatment of acid pumped in the usual manner, allowed to stay under pressure the usual time and then be pumped out. Then the face of the rock could be blasted or wedged off and samples from the whole length of the drill hole be tested in the laboratory in comparison with core samples from similar depths. The wedged-off rock could be examined at various distances from the shot hole and the extreme and intermediate distances of increased porosity determined. What acid treatment does to McClosky limestone would then be known.

At the same time sidewall sampling could be developed and horizontal rotary and acid drilling.

In conclusion let me say that acidizing is one of the five one-word methods of increasing old production, that it has been successfully used in Illinois, and that a considerable field for extension still remains. It is valuable enough to encourage investigation along the lines of heat-treatment, agitation, sidewall coring, fishing, vertical and horizontal drilling, and a field-size experiment at some outcrop of oil-bearing limestone.

"Kinks" for Quarter-Turn Belt Drives

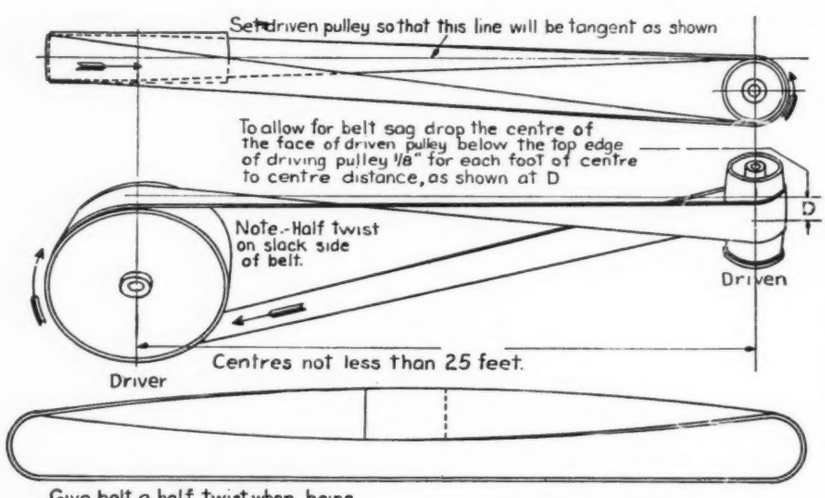
By W. F. SCHAPHORST

INASMUCH as water from wells is frequently used in the oil industry, readers doubtless will be interested in the accompanying sketch showing two worthwhile "kinks" that are employed and recommended by a prominent builder of deepwell pumps. Their adoption will prove useful to anyone who may some day find himself confronted by the problem of connecting shafts that are at right angles with each other. In other words, the "kinks" pertain to "quarter-turn belt drives."

In this particular instance we have a large pulley on a horizontal shaft and a smaller pulley on a vertical shaft. The relative positions are clearly shown, and, as specified, the belt centers should not be less than 25 feet. In fact, the distance should be greater than 25 ft. if the ratio of pump and driver speeds is very large.

But the most interesting and valuable feature is the "half twist" given to the slack side of the belt. By giving the belt a half twist, as shown, the belt naturally will stretch uniformly on both edges and it will be more apt to perform satisfactorily than would be the case if it were not given the half twist. Without such a twist all the stretch will be along one edge, and when that stretch becomes permanent, as it usually does, belt trouble is likely to develop.

The other "kink" is the vertical pulley adjustment recommended for taking care of belt sag, namely, ⅛-in. per ft. of center-to-center distance between shafts.


Set driven pulley so that this line will be tangent as shown
To allow for belt sag drop the centre of the face of driven pulley below the top edge of driving pulley 1/8" for each foot of centre to centre distance, as shown at D
D
Note.-Half twist on slack side of belt.
Driven
Centres not less than 25 feet.
Driver

Give belt a half twist when being made up endless as shown above To prevent belt stretching along one side By this half Turn on slack side of belt the two edges of the belt will be stretched uniformly, the belt will hold its position on the pulleys and its life will be greatly increased.

Lufkin

ON THE NAMEPLATE

Lifetime

ON THE LEASE

"LUFKIN UNITS MANUFACTURED AT LUFKIN, TEXAS BY LUFKIN FOUNDRY & MACHINE COMPANY, QUALITY MACHINERY SINCE 1900."

Cutting and Fitting Threads on Pipe Line Station Equipment

By JOS. L. INGRAM

SEVERAL little tricks, which if applied to the cutting and fitting of threads, will prove well worthwhile when practiced around the shop or engine room of a pipe line station, and especially around reciprocating pumps working under high pressure. The first consideration is to know what kind of a thread one is working with, and what kind is wanted. In the absence of a thread gauge the number of threads on a bolt can be determined by applying an ordinary scale as shown in *a* of the accompanying drawing. The threads most used are shown in *d*, *e*, and *f*. The *V* thread is an equilateral triangle with an angle of 60 deg. on the two sides and the distance between the threads the same.

If a thread is important, and most of them are, care should be taken to get a perfect fit between the internal and external thread, as shown in *b*, regardless of whether the work is done by hand or on the lathe. If the lathe is used, the thread should be tested when almost finished. To do so remove the work from the lathe centers, leaving the dog attached, and if possible insert it in the hole for which it is intended, or, that not being possible, into some nut or gauge. Light cuts are now taken and the operation repeated until the required fit is obtained. If a high finish and extreme accuracy are desired, as in the case of a pattern maker, the last thousandth may be taken off the thread with a soft pine stick covered with lapping compound. The use of plenty of lard oil on the cutting tool for the last cut results in a smooth, polished thread.

When cutting a thread with the die do not set the dies up as far as they will go and then "crowd" it. Take a light cut first and then set the dies closer together until the correct size and fit are obtained. For neat work and keeping the tool in good condition, plenty of lard oil must be used. Oil is cheaper than dies.

In handling threads of large diameter, as those used in holding the engine head down, and where it is necessary to handle a heavy wrench, much hard work and time can be saved by marking the nuts so they can be returned to the same bolt. The holding ability of a thread is very little once it is cross-threaded. Use of a wire brush in cleaning the external thread before replacing the nut often proves a time-saver. A piece of steel wire made into a spring having plenty of tension, and the cutting points flattened out and dressed to an angle of 60 deg., as shown in *g*, is about the best way to clean the internal thread. The handle can be made long enough to reach most any thread.

A drill broken off in a half-tapped hole has extremely undesirable results. Besides the loss of a perfectly good tap, a half day often is consumed in trying to dig out the broken part. To know the correct size drill for the desired thread often means a great deal and may eliminate a complete tie-up of an important piece of machinery. It also frequently happens that when a tapped hole for the desired thread in a piece of work is needed, the table of taps and drills that the mechanic has saved carefully is somewhere else. In such instances a simple formula is quite useful. Applying it to the U. S. Standard threads, which are ¾ the depth of the *V* thread, we have:

$$S = T - \frac{1.3}{N}$$

where

S = Size of drill.

T = Outside diameter tap.

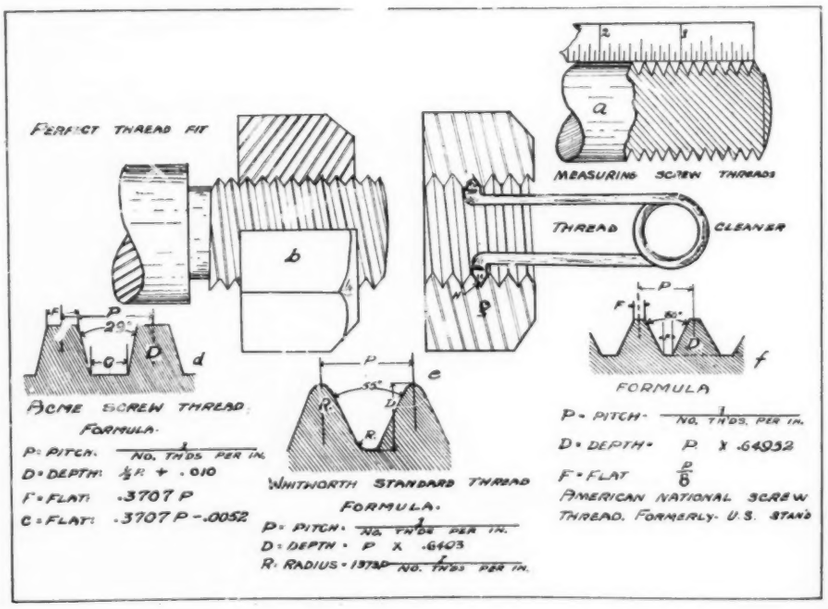
N = No. of threads per inch.

A ¾-in. tap with ten threads will require a ⅝-in. hole, for, $10 \times 1.3 = .13$, and $.13 - .75 = .62$, or ⅝ inch.

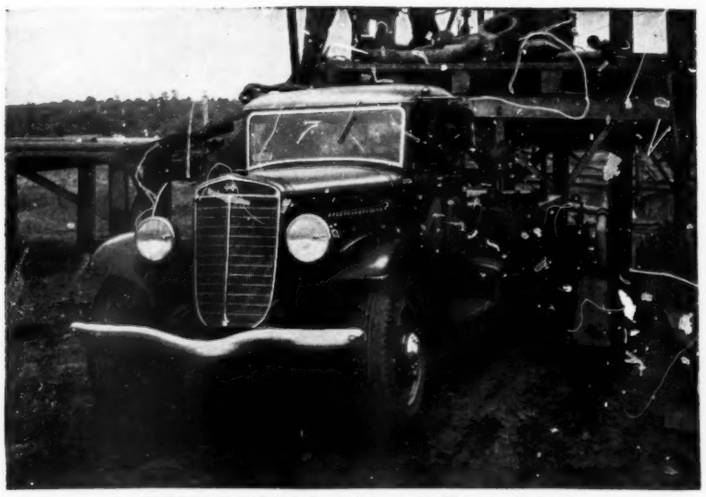
By changing the constant 1.3 to 1.733, the formula applies to the *V* thread and gives an allowance of about .02 in. to .03 in. on each side for forcing by the tap. In tapping cast iron it is better not to allow a full thread, as the sharp edges crumble and are apt to spoil the thread when unscrewed. It is a good idea to allow at least .02 in. to .03 in. on a side when cutting a fairly coarse thread (less than ten to the inch) in cast iron.

The U. S. thread has a flat bottom and top, as shown in the accompanying drawing, and it is not necessary to have any allowance even when threading in cast iron.

Judgment gained from experience will soon tell one the best procedure to take in making the best thread. Experience also may be obtained by watching someone else cut threads.


PERFECT THREAD FIT
a
MEASURING SCREW THREADS
THREAD CLEANER
b
29°
d
e
55°
f
ACME SCREW THREAD FORMULA
P = PITCH = 1 / NO. THDS. PER IN.
D = DEPTH = ½ P + .010
F = FLAT = .3707 P
C = FLAT = .3707 P - .0052
WHITWORTH STANDARD THREAD FORMULA
P = PITCH = 1 / NO. THDS. PER IN.
D = DEPTH = P X .6403
R = RADIUS = .1373 P = 1 / NO. THDS. PER IN.
FORMULA
P = PITCH = 1 / NO. THDS. PER IN.
D = DEPTH = P X .64952
F = FLAT = P/8
AMERICAN NATIONAL SCREW THREAD. FORMERLY U.S. STAND

POWER when you need it—SPEED when you want it in the INTERNATIONAL 2-Speed Axle



An International with 2-speed rear axle. These trucks bring new performance and economy to jobs like yours.

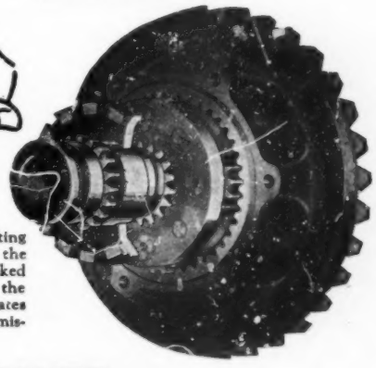
● The 2-speed rear axle trucks available in the International line now make it possible for truck users to obtain both high-speed and low-speed performance in one unit. A simple movement of the shifting lever changes the axle ratios instantly and silently without stopping the truck. The low-gear ratio provides *power* for hauling heavy loads through tough going and up steep hills, while the high-gear ratio allows *high speeds* on level roads or with light loads.

The extreme flexibility of these dual-range, full-floating rear axles enables the International 2-speed axle trucks to do more work at lower cost. When shifted to the low gear, the speed of the engine remains constant, but the speed of the axle and wheels is reduced, thereby providing unusual pulling power. In high gear, of course, the wheel speed is increased.

When you see these 2-speed rear-axle Internationals in action in a tough spot, you will get a good idea of what they can do for you. Ask the nearest Company-owned branch, or International dealer, for a demonstration. There is a full range of other trucks in the International line, from the Half-Ton unit to the powerful Six-Wheelers.

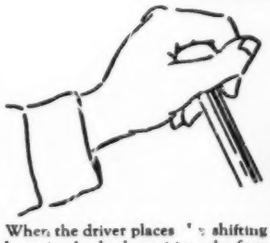
INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
606 So. Michigan Ave. Chicago, Illinois

FORWARD for SPEED



When the driver places the shifting lever in the forward position, the four planetary gears are in the locked position and turn as part of the differential. The truck then operates as a high-speed unit in all transmission gears.

BACK for POWER



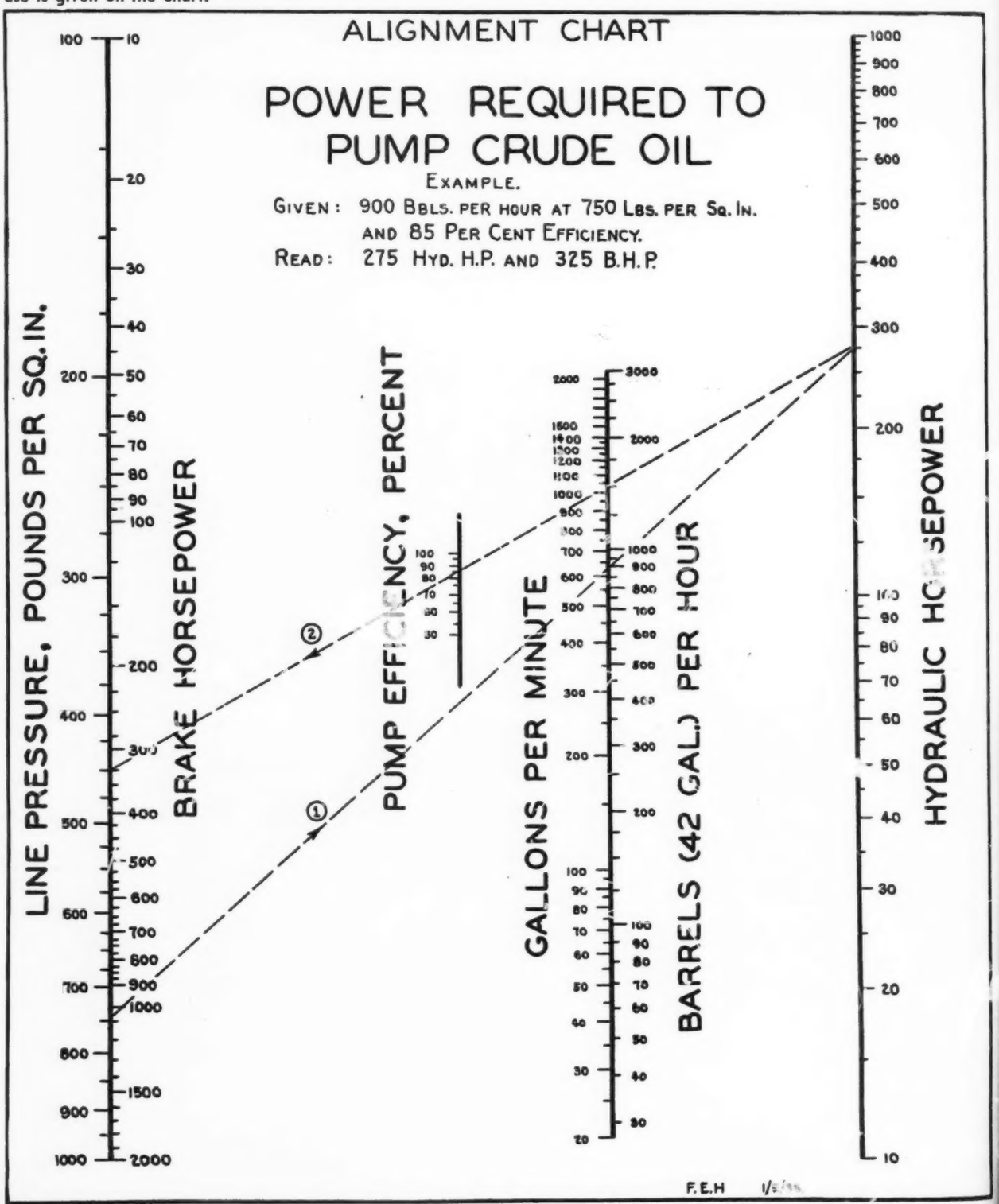
When the driver places the shifting lever in the back position, the four planetary gears are in the unlocked position, which allows them to rotate around the locking gear, thereby making a silent reduction of axle speed. The truck then operates in all transmission gears as a powerful low-speed unit.

INTERNATIONAL TRUCKS

Alignment Chart for Determining Power required to Pump Crude Oil

By FRANK E. HANGS

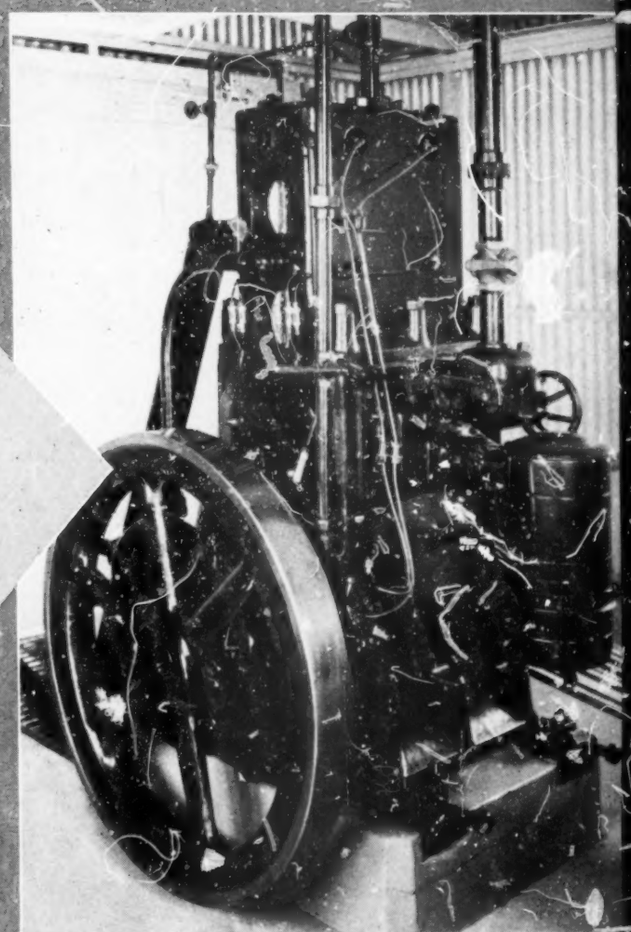
This alignment chart for determining the power required to pump crude oil is self-explanatory. An example of its use is given on the chart.


ALIGNMENT CHART
POWER REQUIRED TO PUMP CRUDE OIL
EXAMPLE.
GIVEN: 900 BBLS. PER HOUR AT 750 LBS. PER SQ. IN. AND 85 PER CENT EFFICIENCY.
READ: 275 HYD. H.P. AND 325 B.H.P.
LINE PRESSURE, POUNDS PER SQ. IN.
BRAKE HORSEPOWER
PUMP EFFICIENCY, PERCENT
GALLONS PER MINUTE
BARRELS (42 GAL.) PER HOUR
HYDRAULIC HORSEPOWER
F.E.H

HERE IS A WAY TO REDUCE PUMPING COSTS

THE new vertical Type G-SD is the fourth engine built by Cooper-Bessemer in its effort to produce a pumping engine to meet modern requirements. Each of the other three failed on some point and the trade never heard of them.

If you are sincerely looking after the interests of your company, you will insist on getting these Type G-SD advantages.



ASK FOR THE TYPE G-SD BULLETIN

1. Crosshead construction cuts lube oil consumption.
2. Crosshead construction gives better scavenging and operating economy.
3. Two cycle two cylinder type at medium speed shows less down time, lower maintenance costs.
4. Timken main bearings make starting easier and reduces down time.
5. Die forged crank shafts and connecting rods reduce maintenance costs.
6. Pressure lubrication to all bearings, including wrist pins, reduce wear and maintenance to minimum.
7. Crank pin bearings are inexpensive replaceable precision shells to reduce upkeep costs.

• • •

There are many other features which result in producing oil over a long period at a lower cost.

THE COOPER-BESSEMER CORPORATION

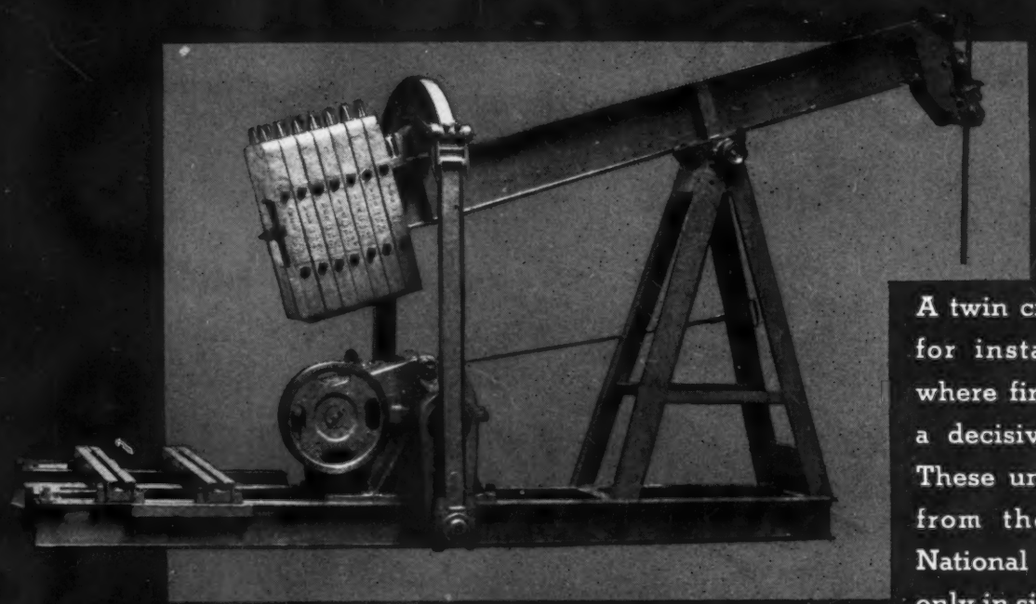
Mt. Vernon, Ohio — PLANTS — Grove City, Pennsylvania

11 West 43rd Street, New York City
Mills Building, Washington, D. C.
640 East 61st Street, Los Angeles, Calif.
201 East 1st Street, Tulsa, Oklahoma
631 Spring Street, Shreveport, La.
Magnolia Building, Dallas, Texas
Esperson Building, Houston, Texas

L. W. Rogers, 6 Finsbury Square, London, E. C. 2.

Introducing THD 200 G

THE LATEST ADDITION TO . . . NATIONAL'S EXTENSIVE LINE OF . . . . . UNIT PUMPERS



A twin crank unit for installations where first cost is a decisive factor. These units differ from the larger National Pumpers only in size and in the use of plain cranks and beam counterweights.

THE NATIONAL SUPPLY COMPANY

NSCO
REG. U. S. PAT. OFF.

National

Raising the pipe from the ditch and placing it on skids

By

FRANK H. LOVE

Extensive Pipe Line Reconditioning Project

Latest practices employed in repairing approximately 900 miles of pipe line in program involving old portions of a trunk system in Texas

CONTINUING the program begun last year of reconditioning the older portions of its trunk system in Texas, the Magnolia Pipe Line Company already this summer has completed more than 300 miles of such work on its line, with an extensive program yet remaining. In all, approximately 475 miles of pipe line will be reconditioned during 1936, the schedule calling for 350 miles between Electra and Beaumont, approximately 50 miles on the line between Mirando City and Luling, and 75 miles on the Ranger line between DeLeon and Corsicana. These lines are 8 in. in diameter with a wall thickness of 322 mills, and some have been in the ground as long as 24 years. That between Electra and Beaumont was laid in 1912, the Mirando City to Luling line in 1926, and the Ranger line was laid in 1918.

During 1935 a total of 550 miles of pipe was reconditioned, between Corsicana and Beaumont, and Luling and Beaumont.

The entire program has been accomplished without disrupting traffic through the lines. Pumping has been continuous except in rare instances when it has been necessary to replace a section of pipe or when a break has occurred. The latter, however, has been reduced to a minimum by careful handling in raising and lowering the pipe, accomplished by means of manually-operated tripods and ratchet jacks.

The entire trunk system is not being uncovered and inspected, but only those sections that are known to require reconditioning. Such sections are determined by consulting the company's leak records. After the areas to be repaired are selected the pipe is first uncovered. The average depth of the covering is 22 in., although this varies. Approximately one-half mile of line is being uncovered per day by each "gang."

As mentioned, tripods equipped with ratchet jacks are employed for raising

Repairing a bad section of pipe with a half sole

All collars found sweating were burned out and welded

the pipe from the trench. Generally each gang uses three of these hoists, which are of light weight, making them easily moved about on the job. As the pipe is lifted above the trench skids are placed beneath it and there it remains in readiness for the cleaning machine. The latter is of the type customarily used for this kind of pipe line work, being equipped with revolving scraper knives and steel-wire brushes for removing old coating, scale, etc., leaving the pipe in suitable condition for inspection for pits, bad collars, and leaks. Rust is removed from pits both by hand- and mechanically-operated sharp-pointed "pecking" tools. Inspectors examine the pipe and mark it for spot welding and half soling, the method of repair to be employed being determined by the depth and frequency of the pits. Collars and flanges likewise are inspected for sweats and leaks. Those found sweating are burned out with an acetylene torch and welded on both sides. Collars found to have been caulked are repaired with steel covers molded to fit the collars and welded on. All pits measuring 150 mills in depth, or approximately one-half the wall thickness of the pipe, are repaired by one of the methods described. All spot welding and half soling is done by the electric method.

When the line thus has been repaired another travelling-type cleaning machine is run over it, this a smaller one than that first employed, which, together with a subsequent washing of the pipe with gasoline, assures entirely clean and dry pipe for "doping." This small cleaning machine frequently is passed over the line a number of times, depending upon its condition, or until it is completely free of foreign matter.

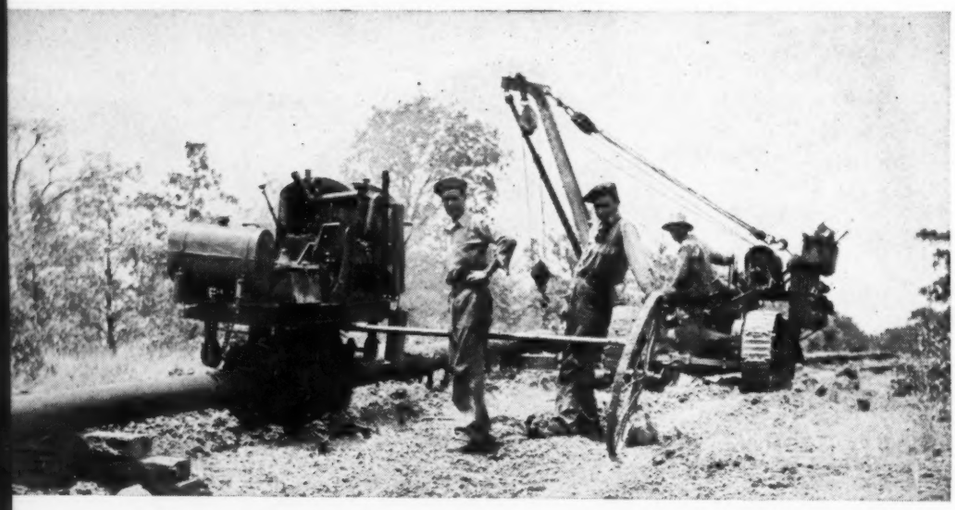
Prior to coating and wrapping, inspectors make a thorough check of the line for leaks, overlooked pits, dirt, scale, dope, etc., using mirrors for examining the underside of the pipe.

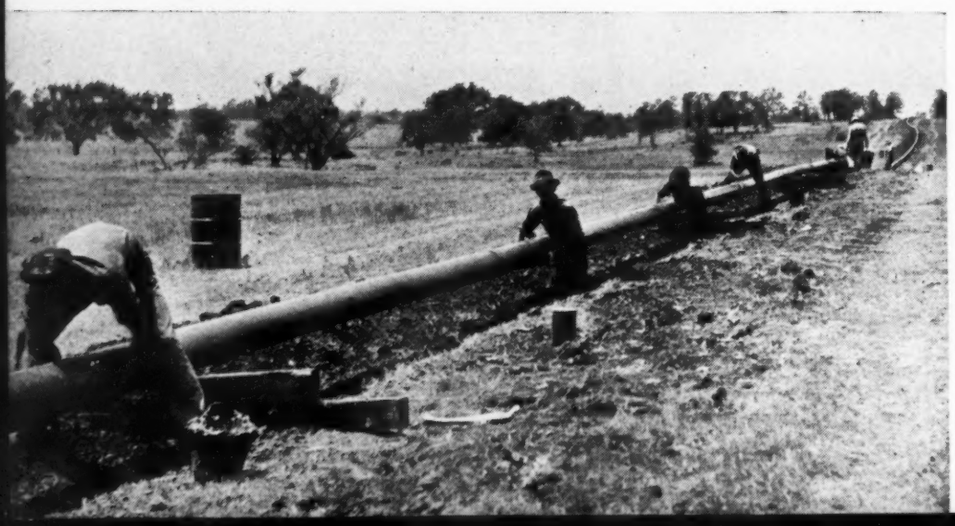
No-ox-id compound is being applied, application being by hand and to a thickness of approximately 3/16 of an inch, being thoroughly rubbed in. Following this the line is spiral-wrapped with a gray fabric wrapper. The wrapper is a canvas-like material that has been boiled in No-ox-id. This also is applied by hand.

The final step in the protection of the pipe is the "ragging on" of emulsified pipe line paint, put on cold and allowed to dry thoroughly before lowering in. As an added precaution another inspection is made and the pipe lowered into the ditch by use of the same type hoists employed in raising, the one difference being that in lowering in belts hold the pipe, in this manner avoiding damage to the wrapping and coating.

The matter of removing and reconditioning pipe from beneath highway crossings is determined by the condition of the line in the immediate vicinity of the crossing. If found to be generally good the pipe is left in the ground, otherwise it is removed and reconditioned.

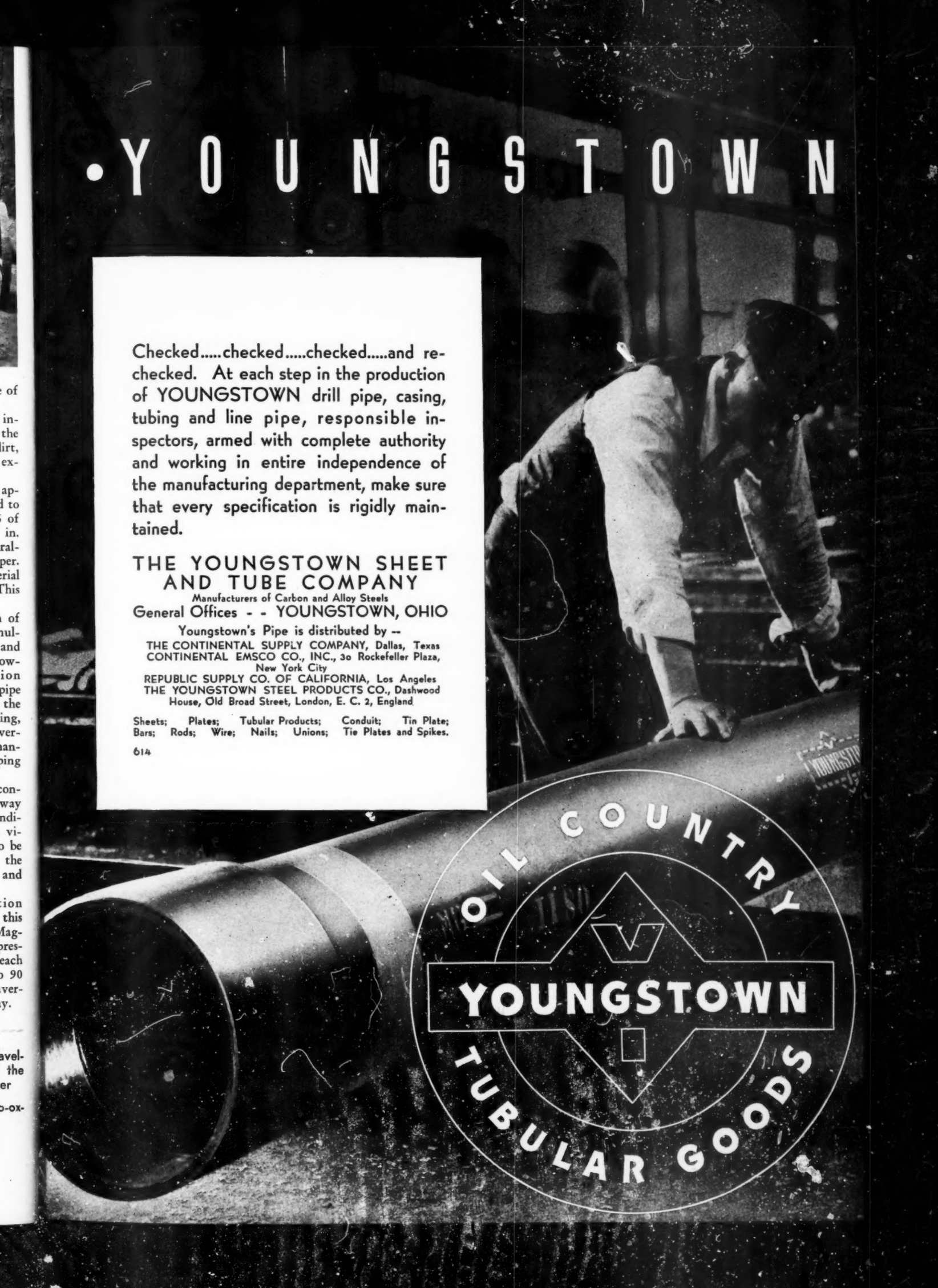
The Mitchell-Stewart Corporation of Dallas, Texas, has contracted this reconditioning work from the Magnolia Pipe Line Company and at present has six gangs in the field, each comprised of approximately 85 to 90 men. Each gang reconditions an average of one-half mile of line per day.





Top photograph—Running a traveling-type cleaning machine over the pipe to remove all foreign matter

Lower photograph—Applying No-ox-id compound to the pipe


•YOUNGSTOWN
Checked.....checked.....checked.....and re-checked. At each step in the production of YOUNGSTOWN drill pipe, casing, tubing and line pipe, responsible inspectors, armed with complete authority and working in entire independence of the manufacturing department, make sure that every specification is rigidly maintained.
THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon and Alloy Steels
General Offices - - YOUNGSTOWN, OHIO
Youngstown's Pipe is distributed by --
THE CONTINENTAL SUPPLY COMPANY, Dallas, Texas
CONTINENTAL EMSCO CO., INC., 30 Rockefeller Plaza, New York City
REPUBLIC SUPPLY CO. OF CALIFORNIA, Los Angeles
THE YOUNGSTOWN STEEL PRODUCTS CO., Dashwood House, Old Broad Street, London, E. C. 2, England
Sheets; Plates; Tubular Products; Conduit; Tin Plate; Bars; Rods; Wire; Nails; Unions; Tie Plates and Spikes.
614
OIL COUNTRY
YOUNGSTOWN
TUBULAR GOODS

Community-Operated Moore Pool is Oklahoma's Latest Big Well Discovery

CONSIDERABLE attention is focused on the latest community-operated area in Oklahoma—the Moore Pool. This new field is situated in Cleveland County, near the town of Moore, and approximately five miles south of the southern extremity of the Oklahoma City field.

To develop this new gusher area the 11 companies that had under lease 1360 acres have decided on a community operation with the Sinclair Prairie Oil Company, the largest leaseholder, as the operator. Other companies interested in the development are the Gulf Production Company, Mid-Continent Oil Corporation, Wirtaine Petroleum Corporation, F. M. Porter, receiver, Carter Oil Company, Empire Gas and Fuel Company, Standard Oil Company of Kansas, Continental Oil Company, Phillips Petroleum Company, and Twin-State Oil Company.

The first two wells upon which potentials were taken rated as 48,000 bbl. and 35,000 bbl. wells, making them among the largest drilled in Oklahoma this year. Production in this pool is found in the Wilcox sand at a depth of approximately 7250 feet. Exploitation of the area began more than a year ago with the first well a large gas well. This was followed by a second test that proved to be a dry hole. Recently the first producer, known as Marvel No. 1, was completed and is the well that now has the 48,000 bbl. potential. The second well, Rice No. 1, also was completed as a producer. The operators then decided to deepen the original gas well, the Franklin No. 1, which was between the two oil producers. Deepening proved successful and on a potential this well was rated at 35,000 barrels. No potential has been made on the Rice No. 1.

The fourth producing well for the field, Sinclair Prairie Oil Company's No. 1 Peaches, was brought in the latter part of July. This well established a potential of 25,000 to 35,000 bbl. of oil per day, and is drilled to a total depth of 7309 feet. The oil flow was accompanied by 23,700,000 cu. ft. of gas.

Indications are that while the wells are large the area may be limited. Already wells drilled on the east and west and found dry show the productive area to be narrow.

Community No. 1 Franklin, discovery well in the Moore Field, Cleveland County, Oklahoma

Publish Specifications on Pumping Machine Ratings

An "A.P.I. Specification on Rating of Pumping Machines," including an "A.P.I. Rating Form for Rotary Counterbalances," has been published by the American Petroleum Institute's Division of Production as a result of work and study by a sub-committee of the Institute's Committee on Standardization of Pumping Equipment and Engines.

The proposal for this specification, officially known as "A.P.I. Standards No. 11-E," originated at the Institute's June, 1932, mid-year meeting at Tulsa, Oklahoma, under the sponsorship of H. N. Marsh, of the General Petroleum Corporation of California, Vernon, California, the then secretary of the Committee on Standardization of Pumping Equipment and Engines. Marsh was appointed chairman of the special sub-committee that prepared the specification. Members are: M. T. Archer, The National-Superior Co., Toledo, Ohio; H. A. Brett, Union Oil Company of California, Los Angeles, California; C. J. Coberly, Kobe, Inc., Huntington Park, California; and E. S. Durward, Shell Petroleum Corp., Houston, Texas.

Copies are available at 35c each from the Institute's Division of Production, 1508 Gulf States Bldg., Dallas, Texas.

THE CORPUS AREA

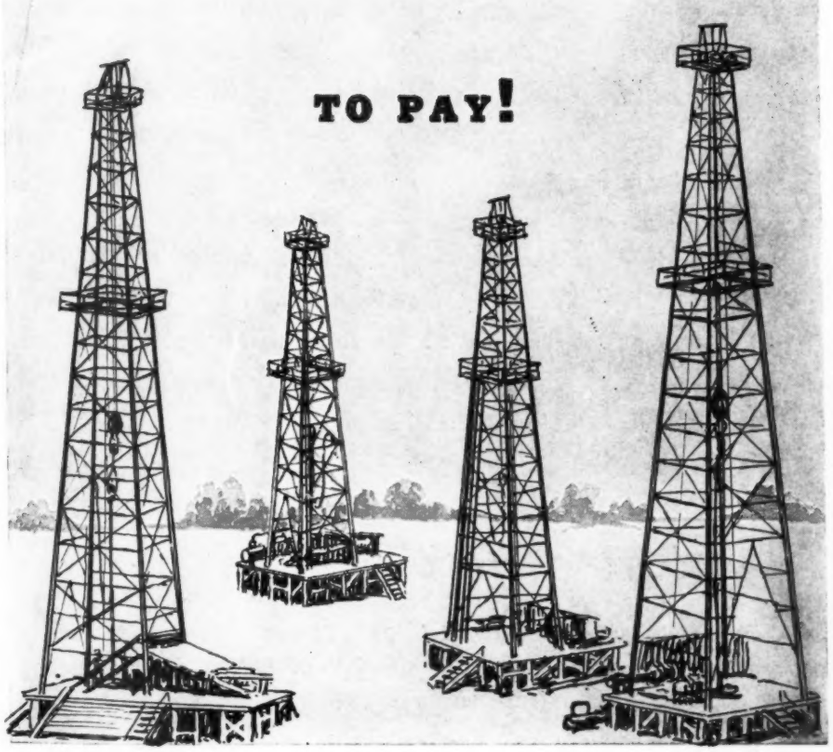
HAS GONE *Maroon* TOO . . .

3 OUT OF 4 WELLS IN THIS HOT SPOT

ARE USING *Colox* TO

CARRY THEM SAFELY DOWN

TO PAY!

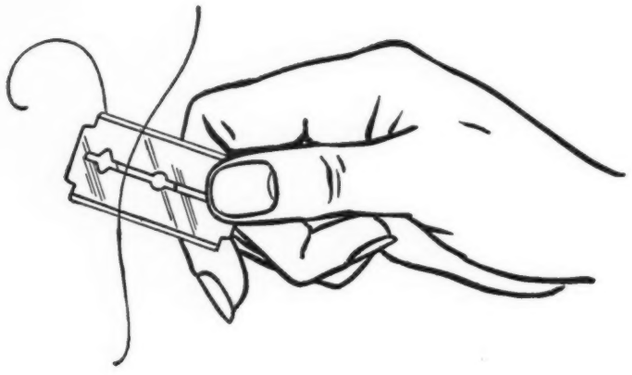


Why? ColoX is doing the kind of job necessary to keep operators out of trouble in this gas impregnated zone. It is building up the required weight, yet keeping the drilling fluid at a viscosity sufficiently low to permit entrained gas to escape readily. It is building thin, yet impervious wall coatings and keeping holes lubricated, and in workable condition.

ColoX and its products, Spud Clay, Meptol, and Chemical "Z", are helping to keep drilling operations safe. That's why three out of four wells using weight materials in the Corpus area are using ColoX, and the Engineering Service that goes with it.

colox

SPLITTING HAIRS



AXELSON stands for extreme care in the selection of production equipment. Axelson recommends pumps and sucker rods best suited to specific pumping requirements. Axelson has always recognized that no two wells are the same, has long taken the lead in developing equipment to meet conditions. In any sensible policy, however, limits are reached,—points are gained beyond which it does not seem wise to go,—then it comes to "Splitting Hairs."

When it becomes necessary to build sucker rods with such a slight variation in price and life as to have occasional heats of supposedly different rods identical, then we believe it's—"Splitting Hairs."

To Axelson it is more than a matter of constantly mounting inventories. It resolves itself into how much and how many,—will be fooled for how long? Axelson wants no part in this "fool the industry program."

Backed by an experience of forty-four years in the manufacture of pumps and sucker rods, Axelson believes that three grades of good rods all designed for specific pumping conditions are enough.

Questionable differences in products of comparative grades have been carried to a point where claims of some of these products are ridiculed by the public. The time has come where the fancied differences in a multiplicity of Sucker Rods are apt to be regarded in the same manner, if they are not already so regarded. Axelson is engaged in manufacturing standardized products of the finest quality that will yield uniform satisfaction in the largest number of installations. We recommend for the Industry's consideration a policy of sucker rod standardization as reflected in these specific types:

●

A First Rod *of high quality, moderately priced for use in light and reasonably heavy pumping operations.*

A Second Rod *of excellent quality, with high tensile, high ductile characteristics which meets reasonably-heavy, heavy and extra-heavy pumping conditions.*

A Third Rod *combining the best features of the Second, but with the added advantage of meeting conditions in wells where corrosion constitutes a problem.*

Axelson Manufacturing Company, P. O. Box 710, Vernon Station, Los Angeles • St. Louis • 50 Church Street, New York • Tulsa
Mid-Continent and Eastern Distributor: Frick-Reid Supply Corp. • *Rocky Mountain Distributor:* Great Northern Tool & Supply Co.

OIL WELL PUMPS **AXELSON** SUCKER RODS

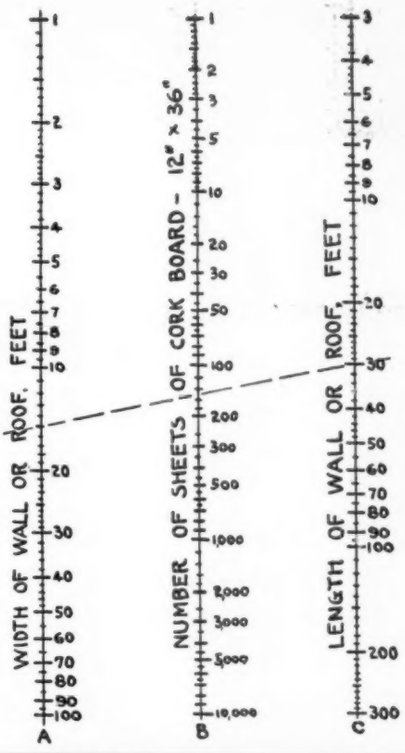
Determining the Number of Sheets of Insulating Material Required in Refinery Ceilings and Walls

THE accompanying chart shows at a glance the number of standard sheets of insulation required in any wall or ceiling of a refinery. The standard size most commonly used is 12 in. by 36 in., consequently that size has been made the basis for this chart. As most refinery officials know, insulation is of considerable value on roofs and ceilings over refineries, for elimination of ceiling sweat, and is being used more and more for that purpose, as well as for wall insulation.

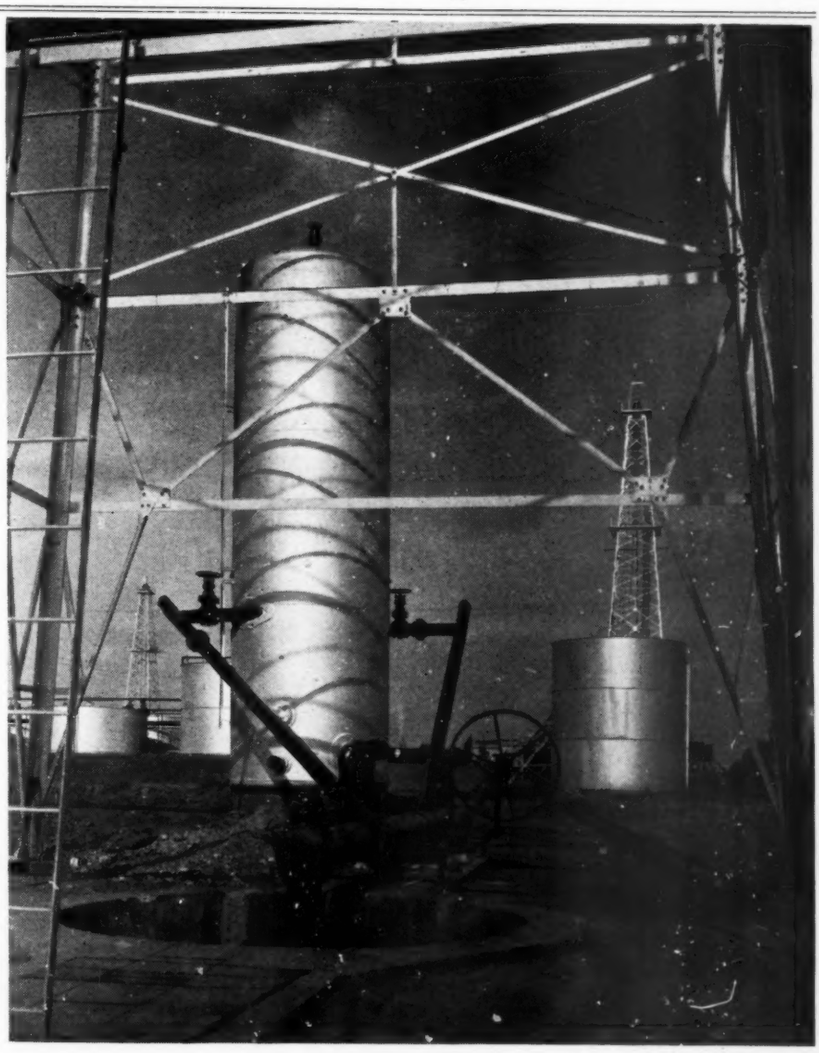
For example, if a given ceiling or wall is 15 ft. wide and 30 ft. long, run a straight line through the 15, column A, and the 30, column C, and the intersection of the line with column B instantly shows us that 150 sheets of insulation will be required. The dotted line drawn across the chart shows how this particular problem is solved.

Although the chart appears to be limited to widths of 100 ft. and lengths of 300 ft. it really has no limit whatever. Thus if the width of the wall should be as great as 1500 ft. and the length 3000 ft. the same dotted line would tell us that 1,500,000 sheets of insulation will be required.

The rule is, where ciphers or digits must be added, add as many ciphers or digits to the answer in column B as the sum of the added digits or ciphers in columns A and C. In the above problem two ciphers were added in column A and two in column C, making a total of four ciphers to add in column B. Experiment with the chart for a few minutes and you will soon appreciate its simplicity and value.

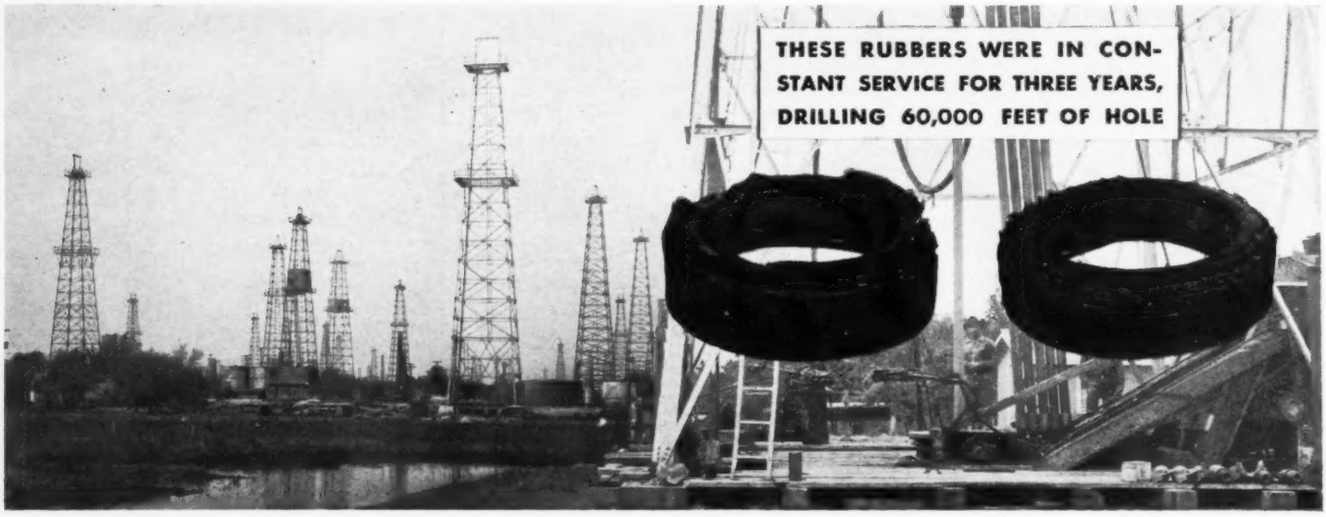


First Oklahoma State Well to Go On Production



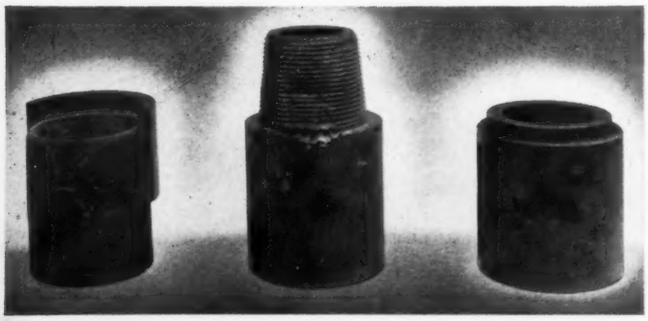
The accompanying photograph is of the Sunray Oil Company's No. 1 State in the Mansion area of the Oklahoma City field, the first well to be completed within the capitol grounds. After topping the Wilcox sand at a depth of 6351 ft., 8⅝-in. casing was set at 6346 ft., and the well began flowing from 800 to 1000 bbl. of oil an hour while being drilled-in under pressure control. Subsequently the well was given a potential listing of 11,263 bbl. daily. It was completed early in June at a total depth of 6353 feet.

UNDER PRESENT



The Hinderliter Tool Company was FIRST to depart from conventional design and construction of tool joints and FIRST to provide a mechanical means for putting tool joints on the drill pipe at the point of operation, supplemented by actual field tests. These initiatory measures were taken by The Hinderliter Tool Company to effect the ultimate safety and economy.

Only pack-off rubbers made to Hinderliter specifications could stand up in such service as those shown above. The remainder of the string from which these rubbers were obtained saw many more months' service in Oklahoma City, Panhandle, and West Texas oil fields.



Typical failures in drill pipe and tool joints—caused by thread leaks commonly called washouts. Hinderliter Tool Joints are GUARANTEED against thread leaks.

T CONDITIONS

The Hinderliter, Patented, Rotary Pack-Off Tool Joint is practically immune to the FOUR outstanding causes of tool joint failures:

ABRASIONS
EXCESSIVE PRESSURES
SUDDEN SHOCKS
VIBRATION STRESSES

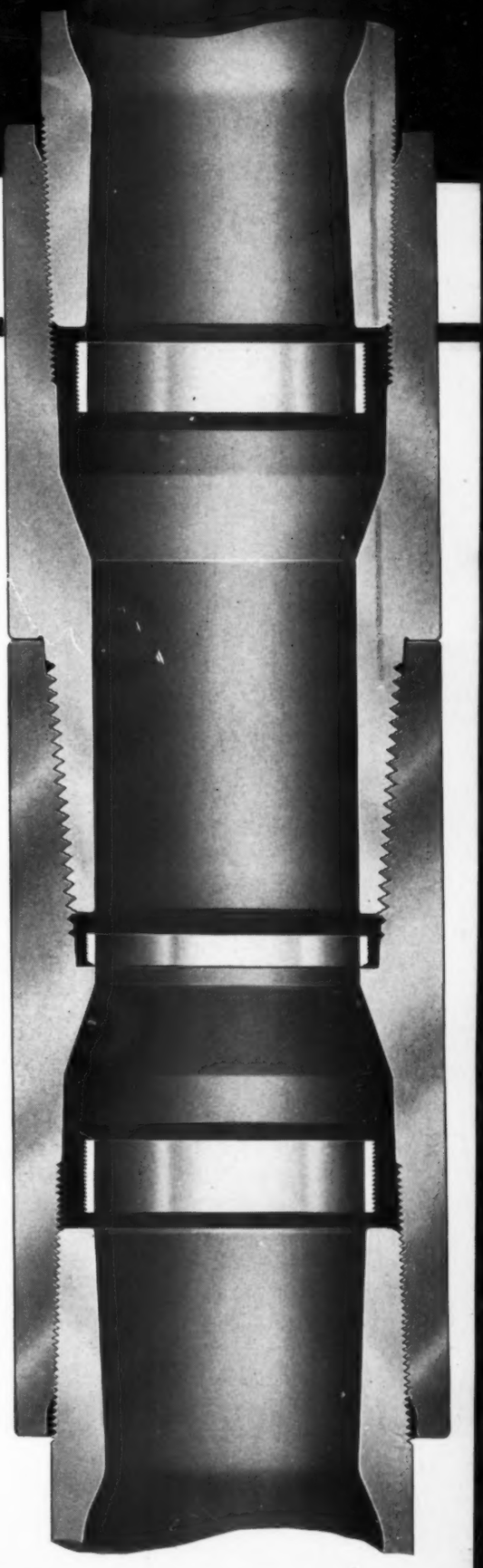
The pack-off rubber seal is positioned in the tool joint by end thrust of the drill pipe, and the pack-off rubber seal conforms to action of the drill pipe.

The fluid seal packing device consists of steel reinforced cylindrical rubber packing rings placed in the tool joint as shown, and fitted with three packing rings.

Sand particles and mud-laden fluid are absolutely prevented from entering the threaded section.

Available in a full range of sizes with big bore and regular water courses.

When your problems become so difficult that outside suggestions are necessary—consult . . .



HINDERLITER TOOL CO.
1150 NORTH PEORIA AVENUE TULSA, OKLAHOMA

Petroleum Demand Largest in History of Industry

A statistical review of petroleum supply-and-demand and price, for the first six months of 1936

By

WILLIAM J. KEMNITZER

THE total demand for all oils in terms of crude oil in the petroleum industry of the United States during the first six months of the year 1936 was the largest in the history of the industry. During this period, the total demand averaged 3,161,000 bbl. daily; 10.4 percent more than the 2,864,000 bbl. required for the corresponding period of last year; and six percent more than the previous peak demand of 2,981,000 bbl. daily in 1929.

Prices of both crude oil at the well and of gasoline at the refinery during the first half of the year were the highest since 1930. The price of crude oil in the Oklahoma-Kansas fields averaged $1.04 per bbl. compared with 94 cents per bbl. last year, an increase of 10.6 percent. In 1930, the price averaged $1.17 per barrel. The price of gasoline at Oklahoma-North Texas plants averaged 6.1 cents per gal., compared with 4.9 cents last year, an increase of 24.4 percent. For 1930, this price averaged 6.6 cents per gallon.

Stocks of all oils at the end of June this year totaled 552,756,000 bbl., and were less by 2.7 percent than the 568,053,000 bbl. on hand at the end of the corresponding period of last year. Stocks at the end of June this year were the lowest since June, 1926, and were 20.8 percent less than the peak volume of 698,202,000 bbl. at the end of June, 1930.

The simultaneous increase in demand with the decrease in stocks resulted in a reduction in the days' supply on hand to the lowest figure on record. The days' supply at the end of June this year amounted to 175, compared with 188 last year, a decrease of 6.9 percent. At the end of June, 1930, the days' supply was 223.

Despite the reduction in stocks on the one hand and increase in demand on the other, a relationship resulting in the reduction in the days' supply above ground, the price of crude oil this year was 15.4 percent less than "normal" (year 1926), and the price of gasoline 16.4 percent less than normal.

This record of the petroleum industry for the first half of 1936 is the best since the "proration" system was invoked in 1927. The striking improvement, however, is not only the result of curtailing production at a time of increasing demand, but also is largely due to the success of cooperative efforts in the manufacturing and distributing of products. The methods leading to such improvement, of course, can continue only so long as they are not unduly monopolistic or harmful to the public welfare.

Following are the statistics of supply-and-demand and price in the petroleum industry of the United States during the first six-months periods for the years 1935 and 1936.

DEMAND
(000's omitted)

Item	Jan.-June 1935	Jan.-June 1936	Percent Change
Total demand	2864	3161	+10.4
Exports	310	320	+ 3.2
Domestic demand	2554	2841	+11.2
SUPPLY			
Domestic production	2739	3074	+12.2
Imports	147	149	+ 1.4
Change in stocks	+22	+62	
STOCKS			
Total volume	568,053	552,756	— 2.7
Days' supply	188	175	— 6.9
PRICE			
Crude oil (per bbl.)	$0.94	$1.04	+10.6
Gasoline (per gal.)	.049	.061	+24.5

ARE YOU OVERLOOKING ANY BETS

IN PREVENTING DELAY IN DRILLING OPERATIONS?

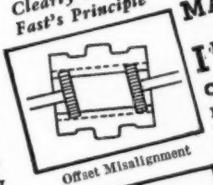
WHEN you equip your drilling rig with Fast's Self-Aligning Couplings you have eliminated all possibility of trouble from that source. To install an inferior device is to invite trouble and delay. The best is the cheapest in the long run.

The load-carrying surfaces of a Fast's Coupling are protected against wear by a positive film of oil. This oil is kept permanently clean by the rocking bearings which make precise metal-to-metal contact, forming dust and moisture proof seals. No perishable materials, springs, grids, etc., are required. There is nothing that needs periodical replacement.

You can prevent delay in drilling operations by specifying genuine Fast's Self-Aligning Couplings on the machinery you purchase.

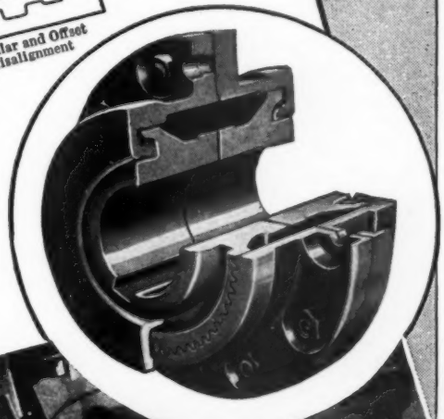
THE BARTLETT HAYWARD COMPANY
BALTIMORE, MARYLAND

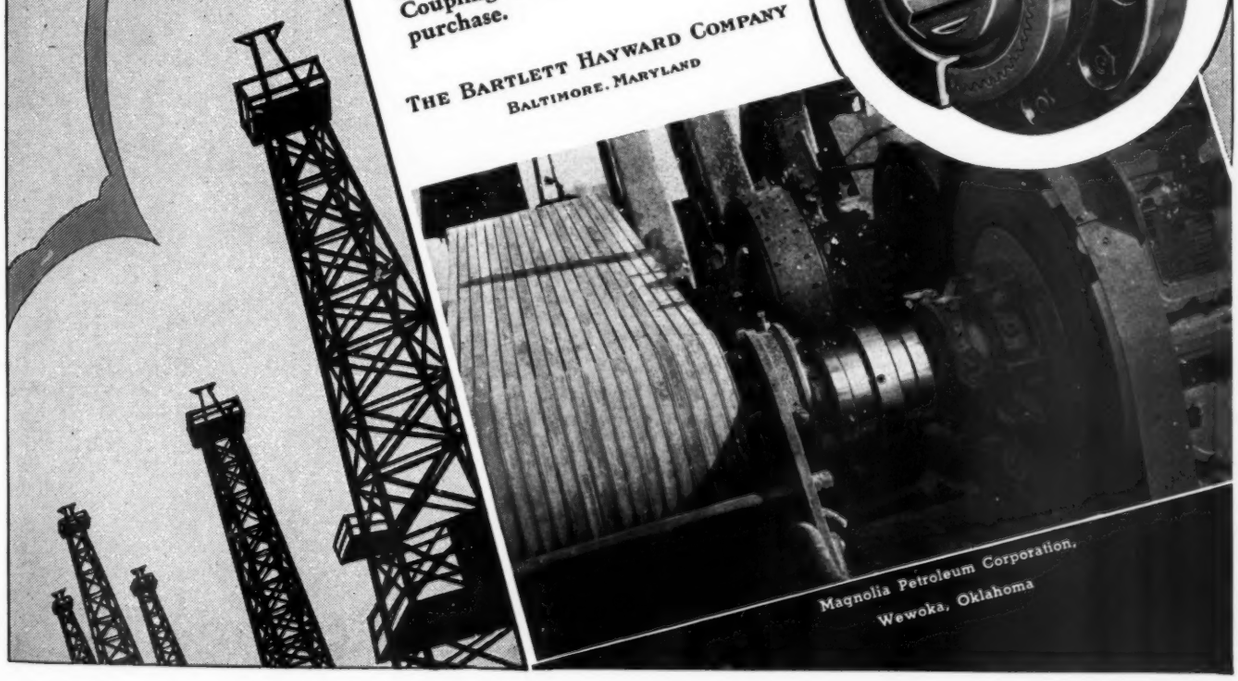
Exaggerated Diagrams to Clearly Define Fast's Principle



FAST'S PRINCIPLE MADE PLAIN

INSTALLING a Fast's Self-Aligning Coupling, in effect, places spur gears on the ends of the shafts that are to be connected. A floating sleeve with internal splines fits over these gears, meshing with them. As one shaft turns it rotates the sleeve and, of course, the other shaft — all operate as a unit. The floating sleeve forms a dust and moisture proof jacket that contains oil which prevents wear.





Magnolia Petroleum Corporation,
Wewoka, Oklahoma

Studies of Repressuring and Water-Flooding*

By
ALFRED H. BELL[1]

THE recovery of oil by the injection into the oil sand of natural gas or air began in Illinois in 1922 and the success of some of the early repressuring experiments resulted in the adoption of this method on some 107 leases with a total area of 11,049 acres, of which it was estimated that 3,488 acres had been affected by repressuring by 1932. A drastic reduction in prices of crude oil took place in the spring of 1931 and this was followed by a period of rapidly fluctuating prices and restriction of the market for crude oil. Consequently expenditures for new development, both drilling of wells and the further adoption of repressuring, practically ceased and the maintenance of wells, well equipment, etc., were severely curtailed. Although it was an unfavorable time for plant expansion, the time seemed particularly opportune for undertaking investigations fundamental to expansion of plant and production at a later time when economic conditions were better. Accordingly in 1931, the State Geological Survey undertook an investigation covering the repressuring operations to date and a preliminary report was published.

At the same time the need was stressed for a program of coring the oil sands in the producing fields of the State for two purposes: (1) to estimate reserves of oil remaining underground in proved fields, and (2) to determine the underground conditions peculiar to each locality so that the production method most suitable for each could be chosen and applied. To this end a cable-tool core-barrel[2] was purchased by the Survey for use by operators when new wells were drilled in the oil fields.

Since the publication of (Illinois Petroleum No. 23) the preliminary report on air and gas repressuring in 1932, very few new repressuring installations have been made. The only one that has come to Survey's attention is that of the Ohio Oil Company in the Colmar-Plymouth field, McDonough County. Two plants have been installed, in the "south" and "east" pools respectively. That in the south pool has been described in a published paper by Mr. Flood. The plant in the east pool, which is much the larger, began operation last year. There are 20 input wells in the south pool and 46 in the east pool. The Ohio Oil Company reports a very satisfactory increase in production due to this operation.

Shortly after the repressuring study was begun, a case of natural water flooding came to the Survey's attention which required immediate investigation in order to decide as to the advisability of further drilling in the vicinity of the flood. The results of the study then made were published in Illinois Petroleum No. 22, "Effects of water-flooding on oil production from the McClosky sand, Dennison Township, Lawrence County, June 18, 1932," and an information circular under the same title in February, 1932.

Further field investigations revealed that although the McClosky flood may be a unique example of a natural flood it is by no means an isolated one. The presence of abundant water in the Robinson sand in the Flat Rock and other pools in southern Crawford County had long been known. Other areas subjected to natural water-flooding were the Buchanan sand producing area, Lawrence County, the Bridgeport sand area, Petty township, Lawrence County, the Lower Partlow sand area, Johnson township, Clark County, the Applegate area, Petty township, Lawrence County, the Carlyle, Sandoval, and Dupo fields in western Illinois. Field data regarding many of these areas of natural water floods have been presented before the annual Petroleum Conferences of Illinois-Indiana, of which the fourth will be a little later this year.

In addition to natural water floods a considerable number of accidental water floods were found. These resulted when water from an upper water sand entered the oil sand through leaky casing in an abandoned well. This water spreading outwards in all directions from the inlet well in many cases caused noticeable increases in the production of one or more nearby wells.

The following papers dealing with water-flooding have been published:

(1) Further data on natural water-flooding in Illinois oil fields—by A. H. Bell, pp. 11-26.

(2) Accidental floods in Illinois and Indiana oil sands—by Frederick Squires, pp. 27-36.

(3) Recent results in controlled water-flooding—by W. S. Corwin, pp. 37-38.

Table I.—Classification of Data Sought in Field Survey of Repressuring and Water-Flooding

(1) Areas affected; obtain or make maps of leases and wells.

(2) Underground geological conditions in each area; well logs, structure contour maps, cross sections, stereograms.

(3) Production records of oil, gas, and water by leases; desirable by wells but usually impossible to obtain.

(4) Data on costs of production by various methods, balance against revenue from oil recovered and thus determine whether or not a given operation was a financial success.

In June, 1933, legislation was enacted by the State of Illinois permitting the injection of fresh water or other fluid under controlled pressure into oil sands for the purpose of recovering oil. Soon afterwards a water-flooding operation was begun by the Tide Water Oil Company on their Drake and Stifle farms in Licking township, Crawford County. Up till April 1, 1935, these two farms had produced an estimated 4217 bbl. of oil due to water-flooding. I understand that the production has continued increasing up to the present time. An article on the Drake-Stifle flood was presented by Mr. Squires at last year's petroleum conference and is ready for publication. This operation is reported by the Tide Water Oil Company to be a commercial success to date.

Water-flooding developments in the Allendale field, Wabash County, during the second half of 1935 urgently demanded attention and study. Although funds were not available for the Survey to employ a full-time petroleum engineer to undertake an investigation of this and other flood areas, Mr. Frederick Squires generously offered his services, and for about two and one-half months carried on an intensive study of the Allendale area.

Twelve water floods were found in the Allendale area and production records for the majority of them have

*Presented at the Fourth Annual Mineral Industries Conference of Illinois, Urbana, Illinois, April 24-25, 1936.

[1]Geologist, Illinois State Geological Survey, Urbana, Illinois.

[2]For a discussion of the use of the core barrel see: A. H. Bell and R. J. Piersol, "The Need for Sand Coring in the Southeastern Illinois Oil Field," Illinois State Geological Survey, Illinois Petroleum No. 21, December 19, 1933.

HIGH SPEED CLOSING

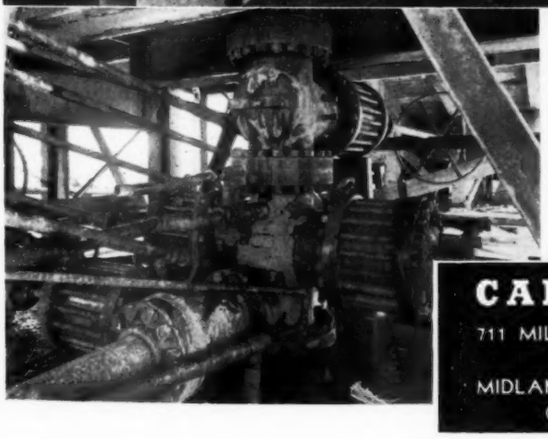
✓ *by means of an enclosed* ✓

fluid pressure system

KEEPS MUD IN THE HOLE!

INDEPENDENT RAM CLOSING AND LOCKING SCREWS PROVIDED FOR EMERGENCY USE

Below: Britton Vincent, driller, shown at the three 4/way control valves which permit instant opening and closing of the cellar hook-up shown below. Hook-up consists of 10¾" Type SDA Preventer; 10¾" Pressure Operated Master Gate Valve; 7" Pressure Operated Flowline valve. Installation on a well in Chambers County.



Catching a blowout instantly, and thus keeping a full column of mud in the hole to help hold kicking well pressure, is more than half the battle won in blowout prevention.

Cameron Type SDA Pressure Operated Blowout Preventers are opened and closed by means of *an enclosed fluid pressure system.* They are *the only ram-type preventers* operated through an enclosed pressure system. Fluid pressure delivered by boiler feed or slush pumps is forced directly against ram operating pistons. High gas pressure blowing up under the derrick floor can not affect fluid pressure in an enclosed system, and therefore can not prevent instant closing in an emergency.

Equally important, and also exclusive with Cameron Type SDA Preventers, are the *independent ram locking screws.* When rams have been closed by fluid pressure, locking screws may be run up handily to hold any pressure that may develop. Or, rams may be closed manually in event pressure is not available. *No other preventer of any type has both of these features.*

There are more than 30 sound reasons why the Cameron Type SDA Preventer is the one for you. The two features above named, combine with 28 other sound features of design and construction to give you a degree of positive control, and hence safety, never before available with any blowout preventer.

CAMERON IRON WORKS, Inc.

711 MILBY STREET — HOUSTON, TEXAS

EXPORT OFFICE: 74 Trinity Place, New York, N. Y.

MIDLAND: W. P. (Red) Knight — BEAUMONT: C. A. Muncey

OKLAHOMA and KANSAS: Carson Machine and Supply Co.

been obtained. It is evident from these records that water moves oil from well to well rapidly and in large amounts. In nearly all cases, water has been admitted from upper sands accidentally through holes in casing. In the wells having defective casing the water stands to within 200 ft. of the top or about 1300 ft. above the bottoms of the wells, thus putting a pressure of about 550 lb. per sq. in. on the oil sand. Because the sand is very open-textured (= permeable) and under this great pressure, water goes in rapidly. It seems probable that under uncontrolled conditions it goes in too rapidly for the greatest possible recovery of oil. Wells in the flooded areas pump straight time and do not pump down. It is altogether likely that water and oil are flowing past existing wells and the oil is thus being lost. In some cases the peak of oil production had passed and increasing amounts of water and decreasing amounts of oil were being pumped.

It cannot be too strongly urged that water-flooding under uncontrolled conditions, while it may yield a temporary financial benefit, is undesirable to the operator if it decreases his total profit by forcing an untimely abandonment of a field.

Through the generous co-operation of the Ohio Oil Company, the Survey has continued to receive data on the measured fluid levels in wells in which the rods or the rods and tubing are removed. These data indicate reservoir pressure for the time and place at which they are taken and when studied collectively they indicate the direction of fluid movement through the oil sand.

Knowledge of the presence of natural water floods, of the direction of fluid movement, and of the pressure gradients are all useful to the operator. However, they are only a part of the data that he should know. Another very important class of information includes data on the amount of oil remaining in the sand, and the texture, porosity, and permeability of the sand, for which coring is necessary.

Bureau of Mines Analyzes Talco, Texas, Crude Oil

THE U. S. Bureau of Mines, Department of the Interior, has obtained samples of oil from two wells in the new Talco field of Titus and Franklin counties, Texas. The oil is produced from the Paluxy sand of lower Cretaceous age at depths of approximately 4200 feet. These two analyses show the oil to be classified as wax-bearing paraffin-intermediate base oil by the Bureau of Mines method of analysis and interpretation. The sulphur content and the carbon residue of residuum are high for oil of this base classification. Considerable interest has been shown in this field because of the unusual properties of the oil and the prospect for large production from this field, which extends parallel to a fault-line.

The detailed analyses of the samples are as follows:

Carr Well No. 1 — **Talco Field** — **Texas**
4190-4208 ft. — **Paluxy Sand, Lower Cretaceous** — **Titus County**

GENERAL CHARACTERISTICS

Specific gravity, 0.907. A.P.I. gravity, 24.5°.
Percent sulphur, 2.77. Pour point, below 5°F.
Saybolt Universal viscosity at 100°F., 200 seconds, Color, brownish black.
Saybolt Universal viscosity at 130°F., 115 seconds.

DISTILLATION, BUREAU OF MINES HEMPEL METHOD

Dry distillation — Temperature °C.	Percent cut	Sum percent	Sp. gr. of cut	°A.P.I. of cut	Barometer 737 mm. — First drop: 38°C. (100°F.) — Viscosity at 100°F.	Cloud test °F.	Temperature °F.
Up to 50							Up to 122
50— 75							122—167
75—100	3.7	3.7	0.669	80.0			167—212
100—125	2.3	6.0	.711	67.5			212—257
125—150	2.3	8.3	.736	60.8			257—302
150—175	2.8	11.1	.756	55.7			302—347
175—200	2.5	13.6	.776	50.9			347—392
200—225	3.0	16.6	.792	47.2			392—437
225—250	3.9	20.5	.808	43.6			437—482
250—275	6.0	26.5	.824	40.2			482—527
Vacuum distillation at 40 mm.							
Up to 200	2.7	2.7	.855	34.0	41	10	Up to 392
200—225	5.4	8.1	.863	32.5	45	25	392—437
225—250	5.3	13.4	.880	29.3	56	45	437—482
250—275	5.1	18.5	.894	26.8	80	60	482—527
275—300	6.9	25.4	.903	25.2	130	80	527—572

Carbon residue of residuum, 17.1%. Carbon residue of crude, 8.0%.

APPROXIMATE SUMMARY

	Percent	Sp. gr.	°A.P.I.	
Light gasoline	3.7	0.669	80.0	Viscosity
Total gasoline and naphtha	13.6	.725	63.7	
Kerosene distillate	12.9	.812	42.8	
Gas oil	7.9	.862	32.7	
Nonviscous lubricating distillate	10.5	0.871–0.897	31.0–26.3	50—100
Medium lubricating distillate	7.0	.897– .908	26.3–24.3	100—200
Viscous lubricating distillate	....	.....	.....	Above 200
Residuum	46.6	0.999	10.1	
Distillation loss	1.5	.....	.....	

King Hughes Well No. 1 — **Talco Field** — **Texas**
4181(?)-4197 ft. — **Paluxy Sand, Lower Cretaceous** — **Titus County**

GENERAL CHARACTERISTICS

Specific gravity, 0.904. A.P.I. gravity, 25.0°.
Percent sulphur, 2.76. Pour point, 15°F.
Saybolt Universal viscosity at 100°F., 180 seconds, Color, brownish black.
Saybolt Universal viscosity at 130°F., 115 seconds.

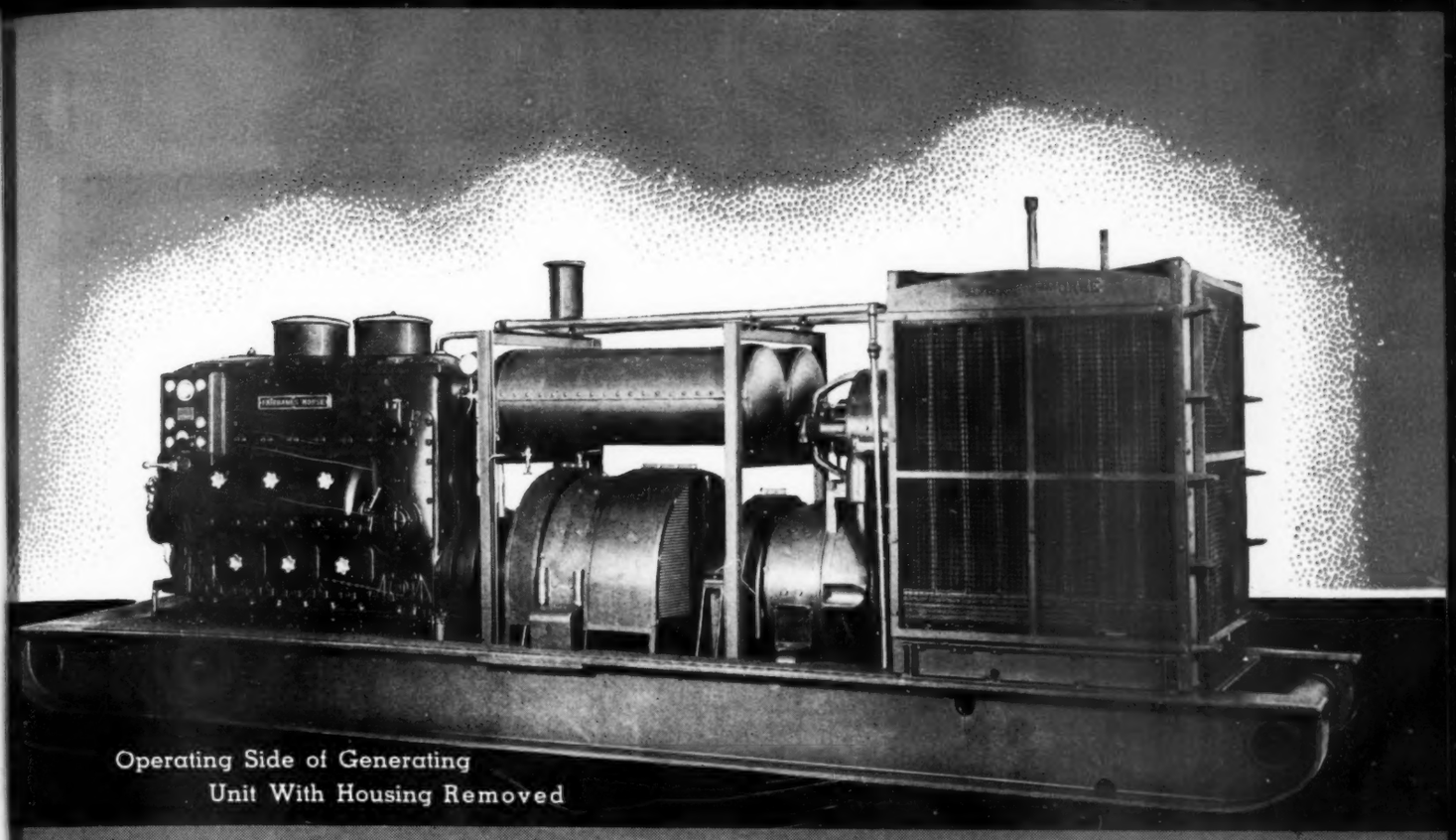
DISTILLATION, BUREAU OF MINES HEMPEL METHOD

Dry distillation — Temperature °C.	Percent cut	Sum percent	Sp. gr. of cut	°A.P.I. of cut	Barometer 737 mm. — First drop: 85 °C. (185°F.) — Viscosity at 100°F.	Cloud test °F.	Temperature °F.
Up to 50							Up to 122
50— 75							122—167
75—100	3.6	3.6	0.671	79.4			167—212
100—125	2.1	5.7	.705	69.2			212—257
125—150	3.1	8.8	.732	61.8			257—302
150—175	2.1	10.9	.755	55.9			302—347
175—200	2.8	13.7	.772	51.8			347—392
200—225	3.2	16.9	.790	47.6			392—437
225—250	3.8	20.7	.805	44.3			437—482
250—275	6.2	26.9	.822	40.6			482—527
Vacuum distillation at 40 mm.							
Up to 200	3.1	3.1	.855	34.0	40	10	Up to 392
200—225	5.2	8.3	.863	32.5	45	25	392—437
225—250	5.2	13.5	.880	29.3	57	45	437—482
250—275	5.0	18.5	.894	26.8	80	60	482—527
275—300	6.5	25.0	.903	25.2	130	80	527—572

Carbon residue of residuum, 16.6%. Carbon residue of crude, 7.8%.

APPROXIMATE SUMMARY

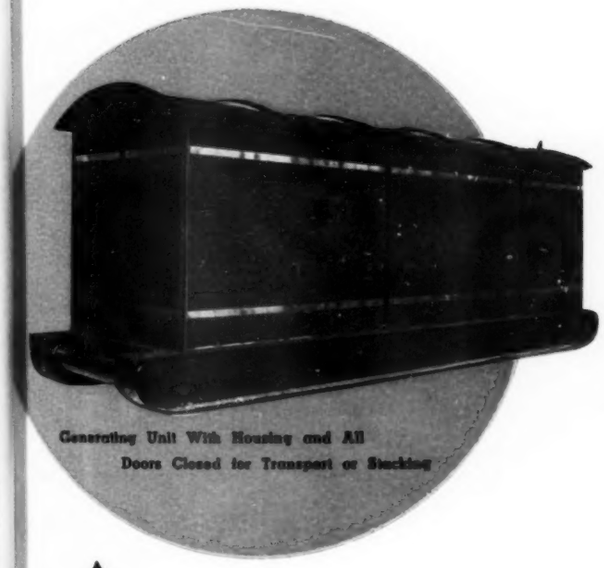
	Percent	Sp. gr.	°A.P.I.	
Light gasoline	3.6	0.671	79.4	
Total gasoline and naphtha	13.7	.724	63.9	
Kerosene distillate	13.2	.809	43.4	
Gas oil	8.0	.861	32.8	
Nonviscous lubricating distillate	10.3	0.870–0.897	31.1–26.3	50—100
Medium lubricating distillate	6.7	.897– .908	26.3–24.3	100—200
Viscous lubricating distillate	....	.....	.....	Above 200
Residuum	47.0	0.996	10.6	
Distillation loss	1.1	.....	.....	



Operating Side of Generating Unit With Housing Removed

CONTINENTAL "OP" *Diesel*

Direct Current ELECTRIC ROTARY DRILLING UNIT



Generating Unit With Housing and All Doors Closed for Transport or Stacking

1. Flexible enough to handle any drilling job.
2. Power enough for any derrick work.

This generating unit, which was shown for the first time at the International Petroleum Exposition, is the latest and most modern type of power plant for deep well drilling.

In addition to a flexible control of the drawworks and adequate power, the Continental "OP" Diesel has the following overall characteristics desirable in a rotary drilling unit: 1. Maximum assurance of reliability. 2. Most effective control of applied power. 3. Maximum economy of rigging up. 4. Greatest possible portability consistent with required performance. 5. Greatest operating economy. 6. Minimum first cost.

For More Complete Information
Write for Descriptive Bulletin

THE CONTINENTAL SUPPLY COMPANY

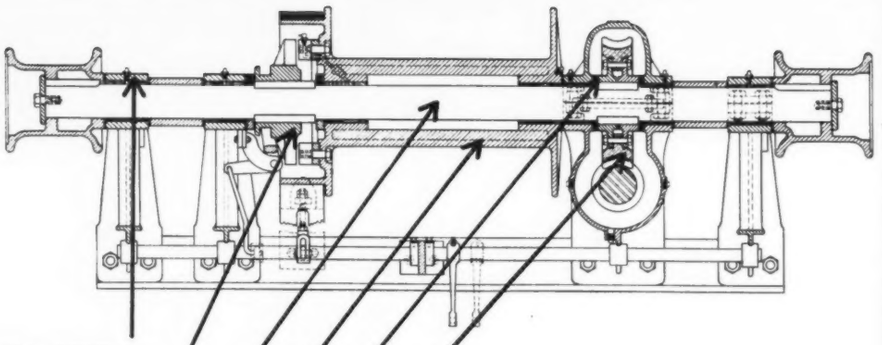
General Offices: DALLAS, TEXAS

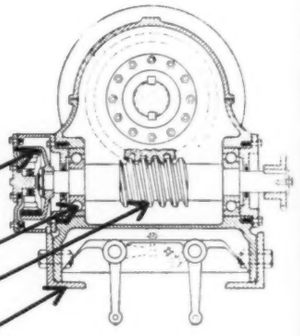
Export Office: CONTINENTAL EMSCO CO., Inc.
30 Rockefeller Plaza New York City, N. Y.

Representatives:
LONDON MARACAIBO PLOESTI BUENOS AIRES

"Serving the Oil and Gas Industries"

CONTINENTAL





BEARING CAPS REMOVABLE ON ALL MODELS LARGER THAN NO. 21. **REMOVABLE GEAR COVER**, ON ALL MODELS, MAKES PRACTICALLY ALL WORKING PARTS ACCESSIBLE, WITHOUT REMOVING WINCH FROM TRUCK.

CLUTCH. MANGANESE STEEL; HEAVY DUTY POSITIVE TYPE.

DRUM SHAFTS. ALLOY STEEL, HEAT TREATED AND GROUND. WITH END MILLED KEY WAYS AND ALLOY STEEL KEYS.

DRUMS. WELL RIBBED AND DESIGNED TO PREVENT CRUSHING. LARGE DRUM BEARINGS.

DRUM SHAFT BEARINGS. REMOVABLE BRONZE. BRONZE GEAR THRUST BEARING ON ALL MODELS.

WORM GEARS. BRONZE MACHINE CUT, MOUNTED ON STEEL OR MALLEABLE CARRIERS.

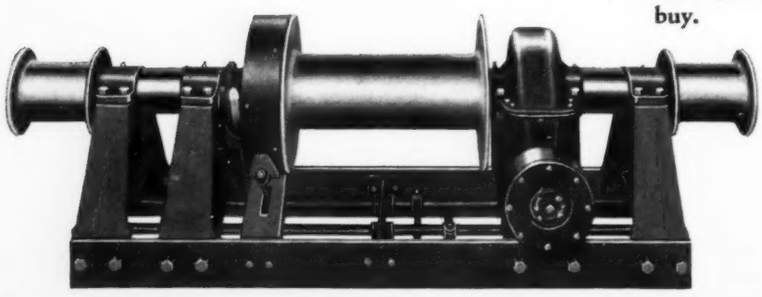
WORM BRAKE. AUTOMATIC, ADJUSTABLE. SEALED OFF FROM GREASE.

WORM SHAFT BEARINGS. HEAVY DUTY DEEP GROOVE BALL BEARINGS.

WORM. FORGED STEEL, HEAT TREATED, HARDENED, AND GROUND JOURNALS AND GROUND THREADS.

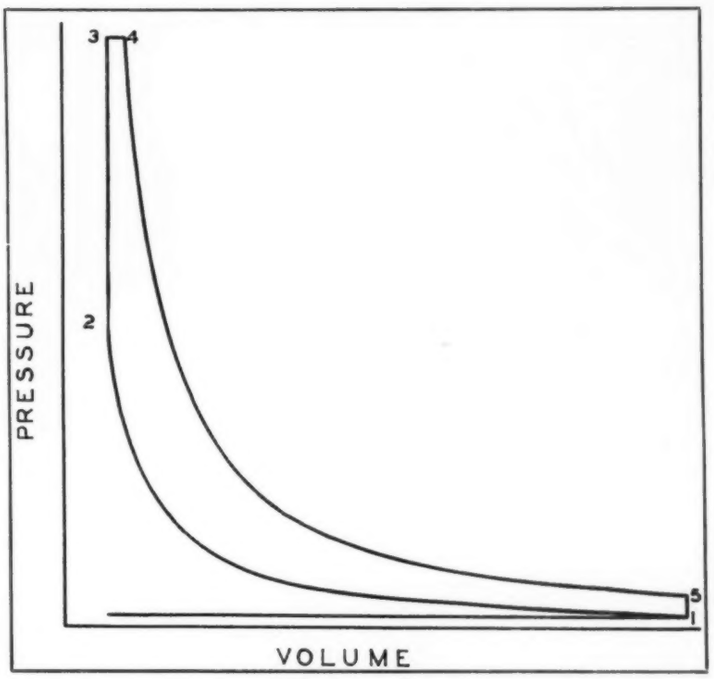
BASE. WIDE, WELL DESIGNED TO PREVENT PULLING OFF TRUCK.

Check Tulsa Winches, part by part, and you'll find them more exactingly engineered and better constructed. Tulsa Winches are built from materials that have been selected for necessary strength and durability without undue weight. For your convenience we have listed the ten most important parts of any truck winch—Check these parts for workmanship and materials before you buy.



TULSA WINCH MANUFACTURING COMPANY
TULSA, OKLA.

Fig. 17. The theoretical mixed cycle pressure-volume indicator card



By JOSEPH LISTON

Part 5

Fundamentals of the Internal Combustion Engine

THE MIXED OR GENERAL CYCLE

IN preceding articles the theoretical cycles for gas, gasoline, and Diesel engines have been presented, and several applications of these cycles to actual engines have been discussed. In general the Otto and Diesel cycles represent actual conditions sufficiently well to make their use of much value in a study of the relative effectiveness of operation of these engines; however, there are some discrepancies, particularly during the combustion period, that show up as rather wide differences between theoretical and actual conditions. For instance, the theoretical Otto cycle assumes that combustion takes place at constant volume, and this, in an actual engine, would mean instantaneous burning of the fuel. Such a condition is not only impossible but also undesirable. The theoretical Diesel cycle assumes constant pressure combustion, and again, this is difficult to attain. Constant-pressure combustion in the slow-speed Diesel is not necessarily bad, but in the new higher-speed designs of so-called Diesels it would be difficult to burn all the fuel at even approximately constant pressure and at the same time attain the other necessary conditions of operation.

To approach more closely the actual conditions found in the newer developments of high-speed compression-ignition engines, the theoretical cycle shown in Fig. 17 has been used to some extent. This cycle has been variously called the dual or mixed or general cycle. Essentially, it is a combination of both the Otto and Diesel cycles because part of the fuel is considered to burn at constant volume, and the remainder burns at constant pressure. It is variable because theoretically the amount of fuel burned at constant volume may be varied from 0 to 100 percent. Obviously, the limits of this cycle are the Otto cycle when all the fuel is burned at constant volume, and the Diesel cycle when all the fuel is burned at constant pressure; hence, this cycle may be considered as the general internal combustion engine cycle with the Otto and Diesel cycles as limiting conditions.

The work of this cycle is found in much the same manner as for the Diesel cycle. The work done during combustion at constant volume is zero because work implies force acting through a distance, i.e., a change in volume. The work done during combustion at constant pressure is:

$$ {}_3W_4 = P_3(V_4 - V_3)\frac{1}{12} $$

where

${}_3W_4$ is in ft-lb.

P_3 is in lb. per sq. in. abs.,

V_3 is the volume at the beginning of constant pressure combustion ($= V_2$) in cu. in.,

V_4 is the volume at the end of the combustion period in cu. in., and

1/12 is the factor for converting in-lb. to ft-lb.

The work done during the expansion period is:

$$ {}_4W_5 = \frac{P_4V_4 - P_5V_5}{n-1} \times \frac{1}{12} $$

And the work done during the compression period is:

$$ {}_1W_2 = \frac{P_1V_1 - P_2V_2}{n-1} \times \frac{1}{12} $$

In these two expressions the pressures are in lb. per sq. in. abs., the volumes in cu. in., and the work in ft-lb. The value for n is usually about the same as for the Otto and Diesel cycles; *i.e.*, between 1.25 and 1.35.

The net or useful work of the cycle is:

$$ W_{net} = {}_3W_4 + {}_4W_5 - {}_1W_2 $$

To facilitate comparison, assuming the same size of cylinder as that used in the preceding analyses of the Otto and Diesel cycles, i.e., a 5-in. bore and a 6-in. stroke, a compression ratio of 13 to 1, and assuming that it is desired to limit the maximum pressure to 800 lb. per sq. in. abs., the work of compression is found as follows:

The displacement is:

$$ D = \frac{\pi}{4} \times 5^2 \times 6 = 117.9 \text{ cu. in.} $$

The clearance volume is:

$$ \frac{C + 117.9}{C} = 13 $$

Or

$$ C = 9.825 \text{ cu. in. } (= V_2) $$

And

$$ V_1 = 9.825 + 117.9 = 127.725 \text{ cu. in.} $$

The compression pressure is:

$$ P_2 = 14.7 \times 13^{1.3} = 412 \text{ lb. per sq. in. abs.} $$

The work of compression is:

$$ {}_1W_2 = \frac{14.7 \times 127.725 - 412 \times 9.825}{(1.3 - 1)\ 12} $$

$$ = -604 \text{ ft-lb.} $$

The work done during combustion and expansion, assuming $P_3 = 800$ lb. per sq. in. abs. ($= P_4$), $P_5 = 40$ lb. per sq. in abs., is found as follows:

The volume above the piston at the

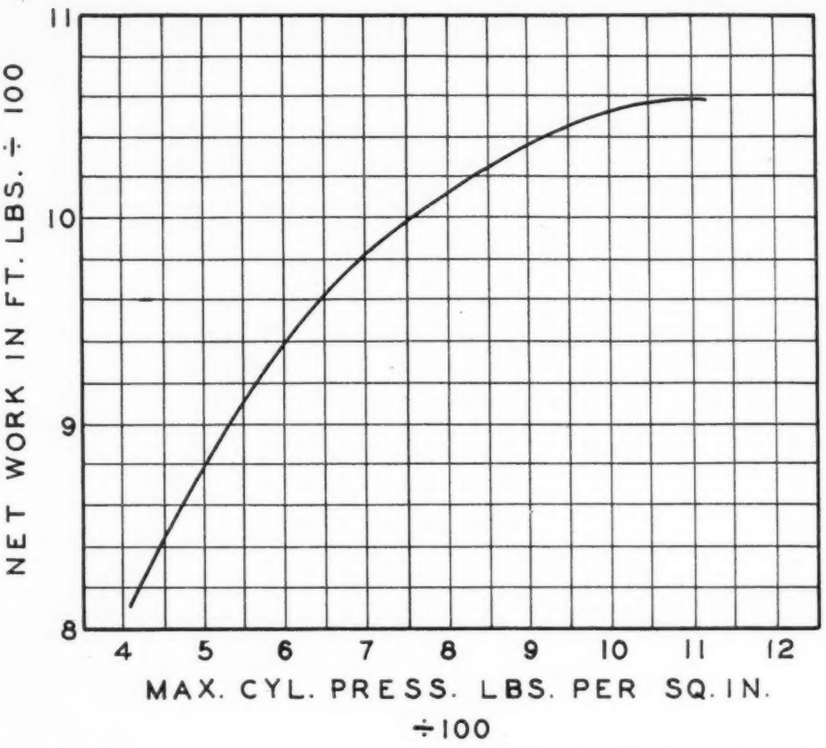


Fig. 18. Variation of useful work with maximum pressure for a mixed cycle card at a compression ratio of 13/1

end of the combustion period is:

$$V_4 = 127.725 \times \left[\frac{40}{800}\right]^{\frac{1}{1.3}}$$

$$= 12.77 \text{ cu. in}$$

The work during the combustion period is:

$${}_3W_4 = 800\ (12.77 - 9.825)\ \frac{1}{12}$$

$$= 196 \text{ ft-lb.}$$

The work during the expansion period is:

$${}_4W_5 = \frac{800 \times 12.77 - 40 \times 127.725}{(1.3 - 1)\ 12}$$

$$= 1420 \text{ ft-lb.}$$

The net work of the cycle is:

$$W_{net} = 196 + 1420 - 604$$

$$= 1012 \text{ ft-lb.}$$

Referring to Fig. 10, for a compression ratio of 13 to 1, it is seen that the net work just determined falls between the net work for the Otto cycle and the net work for the Diesel cycle. Since the initial conditions are the same for all three cycles, it would seem logical that as the maximum pressure varied from the value for the Diesel cycle to that for the Otto cycle the work would also vary from that for the Diesel to that for the Otto cycle. Fig. 18 shows this variation for a compression ratio of 13 to 1 and the conditions assumed in the above calculation.

The efficiency of the theoretical mixed cycle may be expressed as follows:

$$E = 1 - \frac{1}{CR^{n-1}} \left[\frac{\frac{P_3}{P_2}\left(\frac{V_4}{V_3}\right)^n - 1}{\left(\frac{P_3}{P_2} - 1\right) + n\frac{P_3}{P_2}\left(\frac{V_4}{V_3} - 1\right)} \right]$$

where CR is the compression ratio and all the other symbols are the same as used before.

Since the net work of the mixed cycle lies between the net work of the Otto and Diesel cycles, we would expect the efficiency to be an intermediate value also. To illustrate this, for a compression ratio of 13 to 1 and using the same pressures and volumes as found for the above work expressions, the efficiency is:

$$E = 1 - \frac{1}{13^{1.3-1}} \left[\frac{\frac{800}{412}\left(\frac{12.77}{9.825}\right)^{1.3} - 1}{\left(\frac{800}{412} - 1\right) + 1.3\,\frac{800}{412}\left(\frac{12.77}{9.825} - 1\right)} \right]$$

Solving:

$E = .529$ or 52.9 percent.

Referring to Fig. 11, it is seen that this value is less than the theoretical efficiency for the Otto cycle and more than that for the Diesel cycle. Fig. 19 shows the variation in efficiency with maximum cylinder pressure for the mixed cycle.

It is interesting to note the effect of allowing the above expression for mixed cycle efficiency to approach the Otto and Diesel cycles as limits. When the heat is all added at constant volume, $V_4 = V_3$ and the efficiency expression reduces to:

$E = 1 - \frac{1}{CR^{n-1}}$, the expression for the efficiency of the Otto cycle. When all the heat is added at constant pressure, $P_3 = P_2$ and the efficiency expression reduces to:

$$E = 1 - \frac{1}{CR^{n-1}} \left[\frac{\left(\frac{V_4}{V_3}\right)^n - 1}{n\left(\frac{V_4}{V_3} - 1\right)} \right]$$

This is the expression for the efficiency of the Diesel cycle*

The maximum pressures at the ends of the curve, Fig. 19, are the same as the maximum pressures for the Otto and Diesel cycles at a compression ratio of 13. A comparison of the end-point efficiencies for this curve with the values in Fig. 11 at a compression ratio of 13 shows that the efficiencies correspond also; hence, we are justified in calling the mixed cycle the General Internal Combustion Engine cycle and the Otto and Diesel cycles special or limiting cases.

The high maximum pressures encountered in the Otto cycle, especially at the higher compression ratios, necessitate very heavy cylinder construction, and this means added weight to the engine. For stationary engines this is not serious, but in portable or automotive types, this extra weight is undesirable. Figs. 18 and 19 show that a very material reduction in maximum cylinder pressure may be made before a serious reduction in the useful work and efficiency of the cycle is encountered; hence, the high output of the Otto cycle may be approached by using the mixed cycle and placing a limit on the maximum pressure.

In applying this idea to the actual engine, some difficulty may be encountered in gas or gasoline engines where the entire charge of fuel is already in the cylinder at the beginning of the combustion period. In this case, the control of the maximum pressure is difficult, because the charge, once ignited, will burn very rapidly and without very close control on the part of the designer or operator. Some control is possible, but at best the pressure usually continues to rise quite rapidly

(Continued on Page 70)

*It should be noted that the subscripts are different in this expression from those in a preceding article on the Diesel cycle. This is due to using more subscripts on the mixed cycle card, but it does not alter the similarity of the expressions.

A New *Lucey* Store at RODESSA

TO SERVE THE GREAT NORTH LOUISIANA TERRITORY

PRODUCTS LUCEY CORPORATION

A fine new building—complete stocks of drilling machinery, production equipment, line pipe, supplies and hardware. And an organization that stands ready to serve you twenty-four hours every day.

STORES AND OFFICES: Rodessa, Shreveport, Louisiana; Hutchinson, Hays, Wichita, Kansas; Oklahoma City, Stonewall, Maud, Oklahoma.

PRODUCTS LUCEY CORPORATION

LUCEY PRODUCTS CORPORATION

OIL WELL SUPPLIES

TULSA, OKLAHOMA

The Wave of Acceptance

Manufactured under
U. S. Patent No. 1,993,842

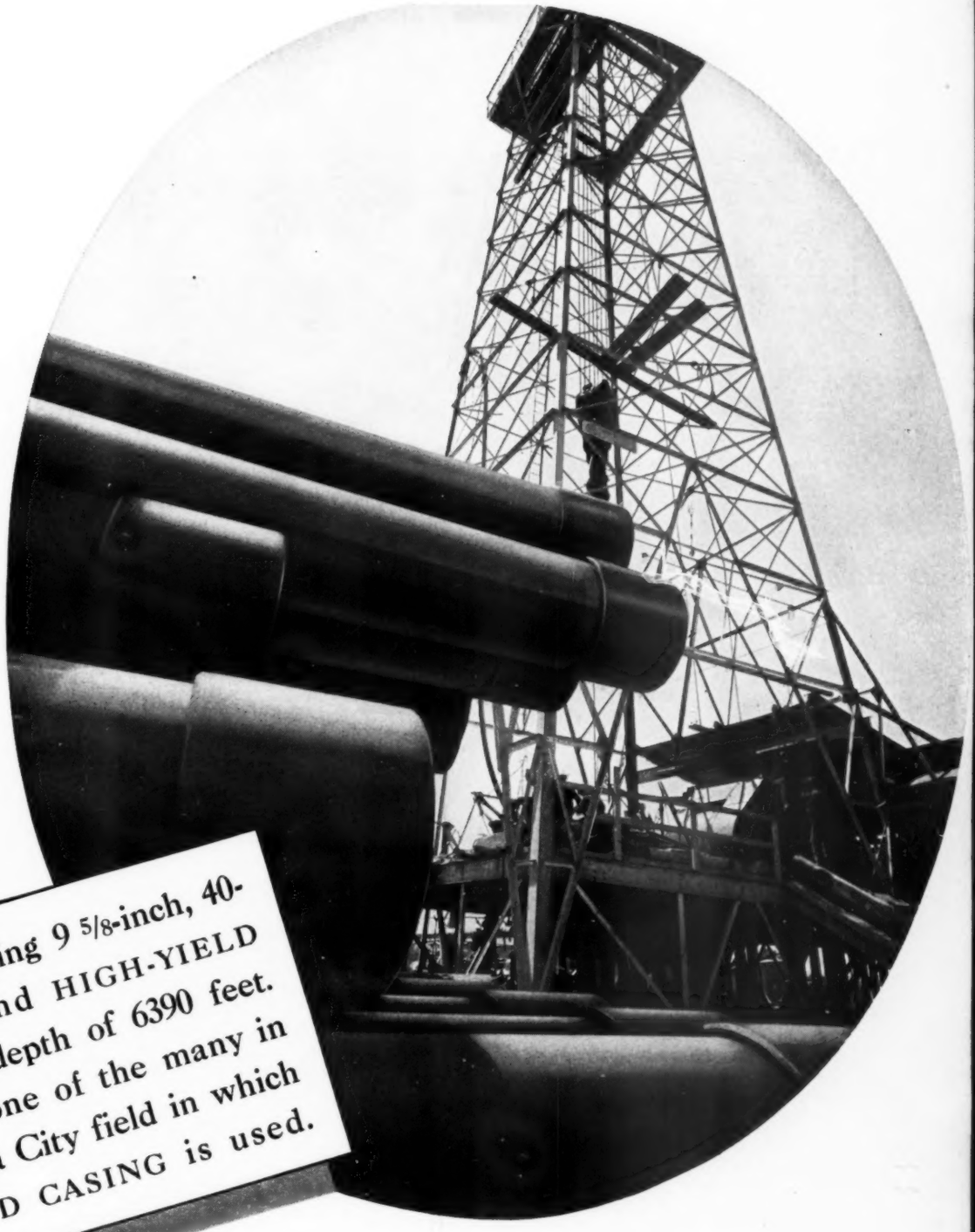
© A. O. Smith Corp., 1936

HIGH-YIELD CASING

GREATER COLLAPSE RESISTANCE • HIGHER PULL-OUT STRENGTH

MORE FOR YOUR MONEY HIGH YIELD CASING **LOWER-COST WELLS**

Rolls On!



Running 9 5/8-inch, 40- and 43.5-pound HIGH-YIELD CASING to a depth of 6390 feet. This well is one of the many in the Oklahoma City field in which HIGH-YIELD CASING is used.

A. O. SMITH CORPORATION

MILWAUKEE, WISCONSIN—*BRANCH OFFICES:* NEW YORK, TULSA, HOUSTON, LOS ANGELES

throughout the combustion period; however, in view of the limits placed on the compression ratio by the tendency of the fuel to detonate, much lower compression ratios are used in gas and gasoline engines, and this restricts the maximum pressures to fairly reasonable values.

In the case of the high-compression fuel injection engines, the rate of injection of the fuel can be controlled, and this in turn controls the rate of heat liberation and in turn the rate of pressure rise; hence, in applying the mixed cycle principle to this type of engine, the fuel is injected rapidly at first to approach constant-volume combustion conditions, and then, when the pressure has risen to near the desired maximum, the rate of injection is slowed down so that combustion approaches constant-pressure conditions.

These ideal mixed cycle conditions are usually rather difficult to attain in actual engines even with fuel injection directly into the combustion chamber. One of the principal difficulties lies in the fact that the fuel does not burn the instant it starts to enter the combustion chamber. At best there is a small ignition lag or delay period in which the fuel is evaporating and coming in contact with the oxygen of the air in the cylinder. This delay period usually occupies several degrees of crankshaft travel, and during this time more fuel continues to enter until, when combustion does begin, so much of the fuel charge is available that combustion proceeds too rapidly. This gives very rapid rates of pressure rise, closely approaching the constant-volume conditions of the mixed cycle, and at first thought it would seem that this would represent excellent practice; however, although all the heat liberation in the theoretical Otto cycle and part of that in the mixed cycle takes place at constant volume, under actual conditions, this cannot be tolerated, even assuming it to be physically possible.

The reason for this enforced discrepancy between actual and theoretical combustion conditions is that too rapid a rate of heat liberation results in too sudden a pressure change and causes hammer-like blows on the piston rather than a smooth steady impulse. Such blows cause a very rapid take-up in bearing clearances that tend to batter the bearing metal and squeeze the oil out of the journals. The effect is apparent to the operator as so-called roughness and noisy operation.

We have observed from the preceding calculations that for a given set of conditions, i.e., compression ratio, initial and final pressures, etc., that the greater the portion of the fuel burned at constant volume, the greater the useful work and efficiency obtained; however, in the actual engine, we cannot approach too closely to constant-volume combustion without rough operation, so it would seem that the best compromise for the actual engine would be to approach as closely as possible to constant-volume burning and yet have other factors acceptable. Tests usually will show maximum performance under these conditions not only in gas and gasoline engines but also in fuel injection or Diesel engines; hence, while the theoretical Diesel cycle shows constant-pressure combustion, most actual cards will show very noticeable pressure rises during burning.

Two major factors largely control this pressure rise phenomenon in the Diesel. The rate of pressure rise may be varied by varying the injection characteristics of the fuel pump. This is largely a problem of the designer. If he wishes to increase the rate of pressure rise he can use a sharper fuel pump cam and thereby inject the fuel more rapidly. It is assumed of course that the injection timing is correct for each case.

The other factor is the burning characteristics of the fuel. Some types of fuels begin to burn much more readily than others when injected into the combustion chamber. This phenomenon will be considered in detail later, but, for the moment, suffice to say that a fuel that is slow to ignite when injected into the cylinder usually gives an excessive rate of pressure rise and rough operation, whereas a fuel easily ignited burns much more smoothly and usually more completely. The new "Cetane Number" methods of rating Diesel fuels are largely concerned with the ignition delay or reluctance of fuels to start burning when injected into the cylinder.

The speed at which the engine operates also has much to do with the rate at which the fuel sould be injected. In a slow-speed engine, for example, the time available for injection is relatively long, Fig. 15, but the same time in a high-speed engine would occupy too much of the stroke and very materially reduce the efficiency of operation. In automotive Diesels the rate of fuel injection must be very rapid in order to get the fuel into the engine in the short time available. This usually requires a fuel having a short ignition delay period; in other words, high-speed Diesels are more sensitive to the type of fuel used. Slow-speed Diesels can burn a wider range of fuels satisfactorily.

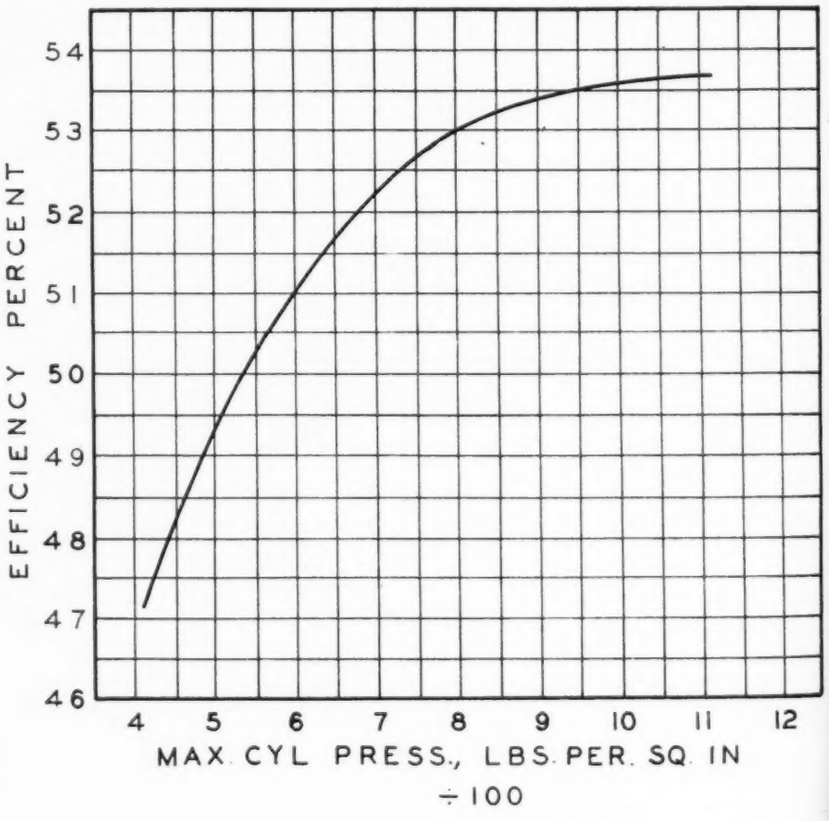


Fig. 19. Variation of efficiency with maximum pressure for a mixed cycle card at a compression ratio of 13/1

SUPREMACY

Gaso Has Specialized in Oil Industry Pumps for 20 Years

Fig. 1740 Gaso Duplex Piston Power Unit

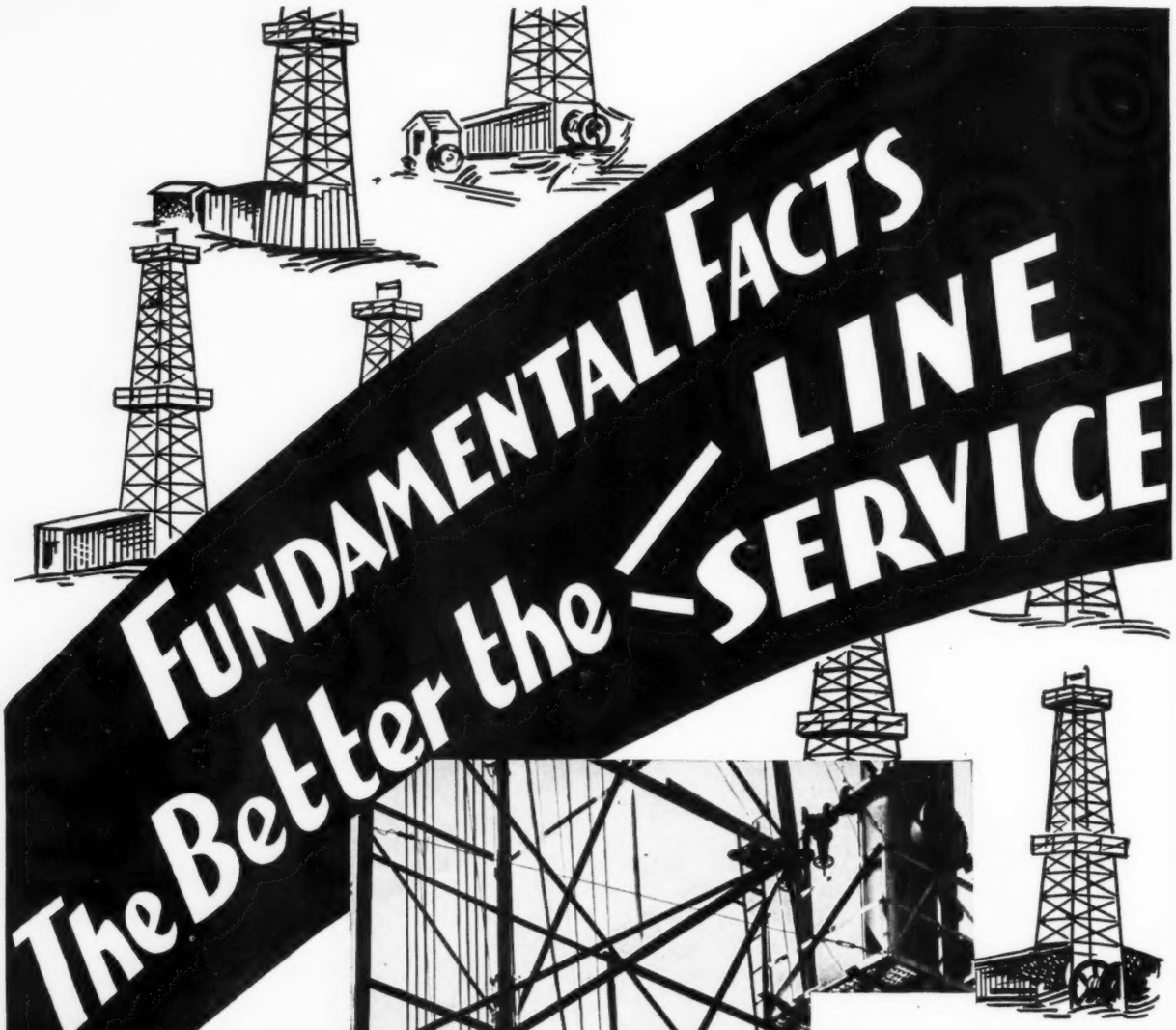
Chided by the other animals because she gave birth to only one cub, the lioness was quick to respond—"It is true that there is only one. But it's a LION!"

Gaso makes no claim to great quantity production. But it does submit that through a policy of strictest concentration, it has attained supremacy in the specialized field of oil industry pumps. Every GASO Pump is considered an individual responsibility, calling for the observance of exacting standards by an organization long experienced in the rigors and requirements of oil-industry service.

It is Gaso's constant aim to give added significance to the simple statement, "It's a GASO!" . . . Gaso Pump & Burner Mfg. Co., Tulsa, Oklahoma. Export Office: 149 Broadway, New York.

GASO PUMPS

for every oil industry need



FUNDAMENTAL FACTS
The Better the LINE — SERVICE

We now submit for Rotary Drilling the new, perfected Line that has proven so remarkable for this service. . . In this line we use the new Uni-Zact Core which is making records.

Write for new catalog

WILLIAMSPORT WIRE ROPE CO.

Williamsport, Pennsylvania — **122 South Michigan Avenue, Chicago, Illinois**

OTHER OFFICES IN ALL PRINCIPAL CITIES

Oil Country Sales Offices: Williamsport Building, Fourth and Midland Valley Tracks, Tulsa, Okla.; 10 North Milby Street, Houston, Texas

Distributors in Texas Louisiana and Arkansas: Mid-Continent Supply Company

General Machine and Tool Company, Distributors in Kansas. . . . American Pipe and Supply Company, Distributors in the Rocky Mountain Territory

Refinery Rush Job Completed Without A Lost Time Accident*

Recently completed overhaul job at Baytown refinery of Humble Oil and Refining Company without a disabling injury is excellent example of efficiency, teamwork, and safe practice under unusual conditions.

By W. H. REBER

Engineering Department, Baytown Refinery, Humble Oil and Refining Company

REPAIRING and overhauling various refinery units and pieces of equipment in the Baytown plant are completed every day. Most of this work is of a routine nature.

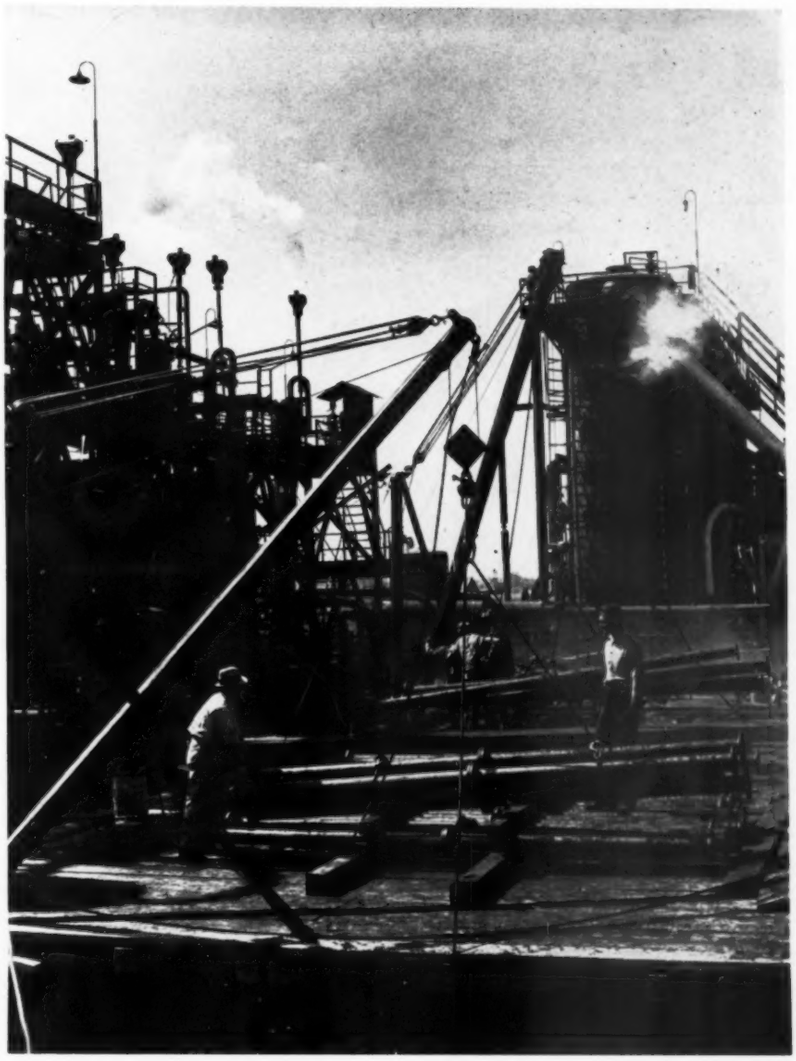
One overhaul job recently completed deserves special mention. The only unusual feature was that it was a rush job. At times there were as many as 350 men working on the battery, on platforms and scaffolds above others, handling and installing material or dismantling parts; walkways had to be kept clear and at the same time material and equipment had to be hoisted and put in place, sometimes in close places.

Practically every safety precaution was observed, both for the men and the equipment. Heavy equipment and small pieces were handled and put into place or taken down with a maximum of efficiency, and as quickly as was consistent with safety. The job was completed and well done within record time, and not a disabling injury was experienced. It is another example of what can be accomplished through coöperation and strict observance of safe practices.

Every device necessary for the safety of the men on this particular piece of work was provided. As has been pointed out many times—the fact that all available safeguards, proper tools, good equipment, et cetera, are furnished, doesn't mean that accidents will be eliminated—it remains for the men themselves to observe safe practice, and the men who worked on this battery have again demonstrated what can be accomplished.

Many pieces of heavy equipment were placed within a comparatively short time that required the services of practically all the various crafts. That many worked at the same time in close places, is significant, considering the fact that there were more than 18,700 man hours of exposure on this job. If each group, and each employe had not been familiar with the safety rules, and therefore not prepared to observe safe practices, the chances are they could not have accomplished the job with such an excellent safety record.

They again demonstrated the fact that safety and safe practice are just as important as knowing how to install pipe, lay brick, replace heavy equipment, weld steel plates, et cetera. Moreover, they demonstrated that doing a job well and at the same time doing it safely, is simply a matter of all working together, each man doing his part efficiently, and everyone putting into actual practice the strict observance of safety precautions that ultimately resulted in no disabling injuries.



Heavy equipment, small pieces were handled and put into place or taken down with a maximum of efficiency and without a disabling accident

*Courtesy *Humble Refinery Bee.*

Here are shown cores taken in a 9000-ft. cable tool well where a big percentage of the footage was cored. Included are samples from various types of formation

Cable Tool Coring in Mid-Continent and Texas Fields

By WALLACE A. SAWDON
Petroleum Engineer, Los Angeles

Scientific methods required in modern drilling operations have brought into more widespread use the cable tool core barrel as a means of obtaining or verifying subsurface information in wells drilled with standard tools.

ALTHOUGH considerable information can be obtained from cuttings bailed from a cable tool well, the data so gained on formations penetrated are no longer sufficient to meet the requirements of scientific methods now used in drilling operations. Thus it is that the cable tool core barrel has come into wide use in the industry; subsurface information in wells drilled with standard tools now is generally obtained or verified by cores. Cable tool coring equipment long has been employed to provide accurate geological data in wildcat areas, to obtain precise information in proven fields, and to procure reliable facts on sand conditions. The use of the cable tool core barrel has increased to a marked degree in the Mid-Continent and Texas during the last few years and its wider application has demonstrated its importance in standard tool operations.

Cable tools are being used in West Texas, the Texas Panhandle, northern Oklahoma, southern Oklahoma, northeastern Oklahoma, and southeastern Kansas. Coring is done in all these areas, particular attention being paid to sand samples taken in connection with water-flooding operations in northeastern Oklahoma and southeastern Kansas. Experience gained in the earlier water-flooding operations in Pennsylvania naturally has been applied to similar operations in the Mid-Continent.

Core analyses are of primary importance in estimating the degree of efficiency that can be expected by water drive. Considerable time and money can be saved by preliminary coring to determine the adaptability of a sand for water-flooding before actual field work is attempted. In the Nowata area in Oklahoma, for example, coring has shown certain sands to be unsatisfactory for flooding. Up to the present only the sand is being cored; but cases may arise where cores will be used to advantage in the determination of strata for confining water-drive operations, and in determining cementing points, plugging depths, etc. Making a selection of the best wells for oil production and the best wells for injecting water is of great importance and in such cases knowledge of the subsurface conditions disclosed by proper coring can be used to advantage.

In all the Mid-Continent and Texas areas where it is the practice to employ cable tool coring, the cores are examined for porosity, permeability, and saturation. Geological data are also recorded, and in the Panhandle a considerable amount of coring is done to select shooting points. The sands in this district vary and by means of information supplied by cores the sand can be shot at a depth where it will be most effective. In the Osage area of Oklahoma many operators core in connection with repressuring operations, the samples obtained being analyzed for subsurface information.

Frequently a string of casing can be saved in cable tool holes by coring. In many areas drilled with rotary tools and completed with standard tools, coring ahead of the water string is

1921 1936

Their Record SPEAKS FOR ITSELF

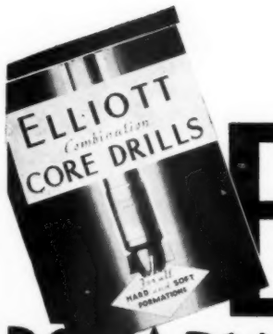
»»» and what a story it tells

Elliott Rotary and Cable Tool Core Drills

Being the original core drill used for coring oil wells on a commercial basis, Elliott has borne the brunt of all that has followed in this field of endeavor. For more than fifteen years Elliott has conducted a core drilling service in direct competition on a price, service and performance basis with every other device developed for this purpose. It has been necessary therefore, to maintain the efficiency of Elliott coring equipment at a point that would enable maximum footage of hole and recovery of good cores at minimum cost of operation and maintenance. This in turn has necessitated continuous development and improvement in perfect step with the foremost progress in oil field practice . . . the design, manufacture and maintenance of the best coring equipment possible from every competitive angle.

Elliott Core Drills had to be good even to survive. They have more than met the issue . . . they have set the pace in coring operations year after year. Their record of consistent leadership may be advantageously interpreted in terms of value by operators who want maximum performance at minimum over-all cost.

ELLIOTT CORE DRILLING COMPANY
4731 East 52nd Drive, Los Angeles, California, U. S. A.
Export Office: 420 Lexington Avenue, New York City



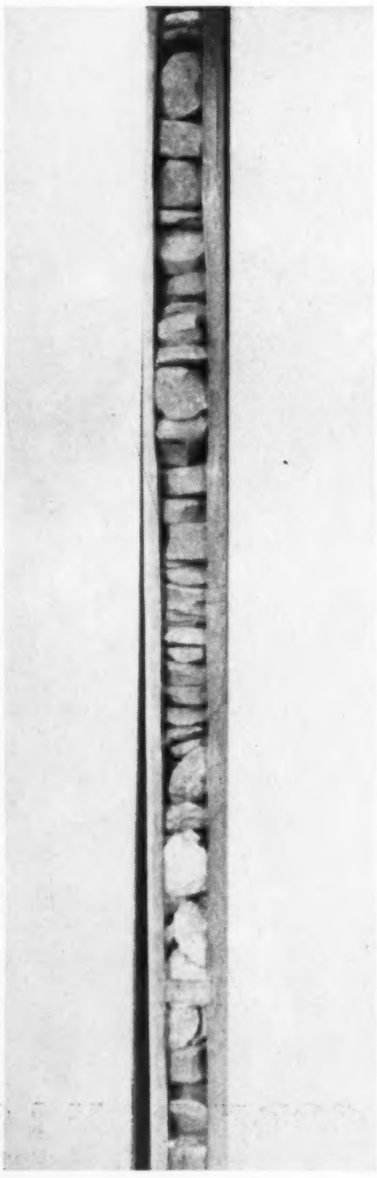
Write for Bulletin No. 36-R, illustrating and describing the improved Elliott Combination Core Drill for all formations.

ELLIOTT

ROTARY and CABLE TOOL CORE DRILLS

done with a rotary core barrel. The casing is run in with rotary equipment and the cable tools then set up. Coring from there on is done with a cable tool core barrel and the information used in completion of the well.

In the Mid-Continent and Texas approximately 90 percent of the core analyses are made in laboratories and the other ten percent in the field. The size of sample will depend on the type and method of core analyses to be made and also on the diameter of the core. A desirable sample for permeability and porosity tests may be from 1½ to 4 inches long; for a saturation test one cubic inch is usually necessary. With a Baker type cable tool core barrel, which is in common use, an inner tube section for collecting the samples and an outer drilling barrel for cutting away the formation around the core make it easy to obtain samples of adequate size. The inner barrel does not rotate; it has no motion except to follow down over the undisturbed core of the formation as the outer barrel cuts an annular hole around the core. The form in which the core is recovered will vary with the formation, since the jar caused by drilling hard formations will tend to break the core into sections as it is being taken. Extremely hard formations usually will be recovered in biscuits of varying lengths. Though the core taken may be fractured into sections during its recovery, its vertical continuity during a run will not be impaired. The core as recovered from the inner barrel gives a sample of the formation as it actually lies in the ground, there being no contamination of the sample after the drill begins to core.



Cores taken from an excessively hard formation with a cable tool core barrel in an Oklahoma well. When properly cored, samples from any type formation can be procured for complete tests of permeability, porosity, and saturation

From results obtained during operations in the Mid-Continent and Texas, an average recovery of 90 percent or better can be expected for all types of formations in those areas. In a well near LaFore, recovery averaged 98 percent in the granite wash. This formation not only was exceptionally hard but was so badly broken as to make coring more difficult than usual. In another well, coring from 3244 ft. to 3324 ft. gave a 90 percent recovery in lime and dolomite. Practically all the samples obtained were large enough for tests for permeability, saturation, and porosity.

Coring the productive zone during well completions often is continued after a well starts flowing. At Fairfax, Oklahoma, the shale was cored in one well from 2811 ft. to 2819 ft.; when coring was continued into the Bartlesville sand from 2819 ft. to 2820 ft. oil and gas started to flow. Upon coring another two feet, the well came in flowing 150 bbl. per hour. Coring was continued further from 2822 ft. to 2825 ft. and a recovery of 100 percent was made. This well also was making about three million cu. ft. of gas while the core was being taken.

Although fluid usually has to be added for coring operations, cases arise where the fluid level is high. At Carlsbad, New Mexico, a well drilled to a depth of 6452 ft. had fluid standing at 1202 feet. The pressure at bottom caused by this fluid head evidently had no effect on coring procedure, for the hole was cored from 6452 ft. to 6457 ft. with 100 percent recovery. Coring was continued with good results.

It is the belief of some operators that by exercising care and using proper methods, practically 100 percent core recovery can be obtained when testing a sand with small footage per run. This is exemplified by a well near Meeker, Oklahoma, where the hole was cored for two ft. at a time and a production test made after each run. As mentioned, the character of the formation will necessarily enter as an influencing factor. In a well near Belleview, Louisiana, 19.5 ft. of formation, including loose gravel, were cored without any loss, a recovery of 100 percent being obtained.

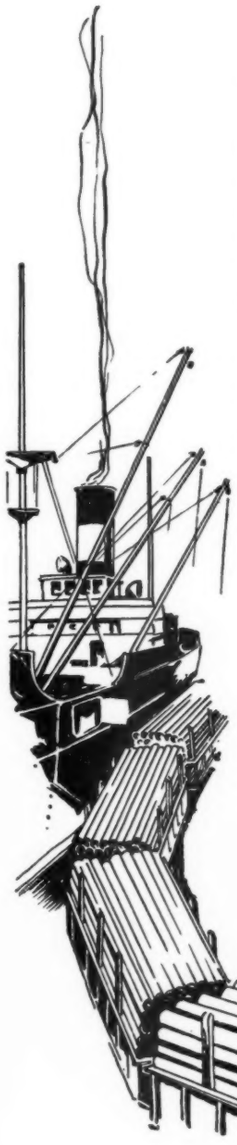
Theoretically it might be contended that a 100 percent recovery is impossible. For all practical purposes, however, where care is maintained in stringing in and checks made over extensive distances cored, the recovery can approach closely a full cored section. Proper identification easily can be procured for geological purposes, and with the samples of proper size for testing, 100 percent recovery often can be claimed. Such a high percentage is seldom absolutely necessary unless very close identification, such as in a productive sand, is desirable for practical use.

Water-flooding operations also may require close coring, especially when a portion of the sand may be more favorable for operations than a lower or higher stratum of the formation. This has been a condition encountered in the Bradford and Allegheny fields of Pennsylvania where the upper part of the sand is often a gas pay. This gas sand has to be packed and cemented off to insure the effective movement of water in the flooded areas and its position often can be determined only by coring. Such accurate determination from cores has increased the efficiency of flooding action by forcing all the water through the oil pay.

Operation of Cable Tool Core Barrel

With few exceptions, the cable tool holes in the Mid-Continent and Texas are practically dry when coring is started. This means, that to get the best results, water has to be dumped into the hole in order to have the core barrel covered with fluid. The practice being followed in this territory is to use a 28-in. to 30-in stroke at a speed of from 20 to 30 strokes per minute. Jars are always used above the stem. In a well near Drumright, Oklahoma, the first few cores were taken with the jars on top and bottom and a swivel socket on top. Recovery was not satisfactory until the core barrel was placed

Accurate Gauging Methods and High Tensile Steel are a few of the many reasons why Chester casing is in such great demand



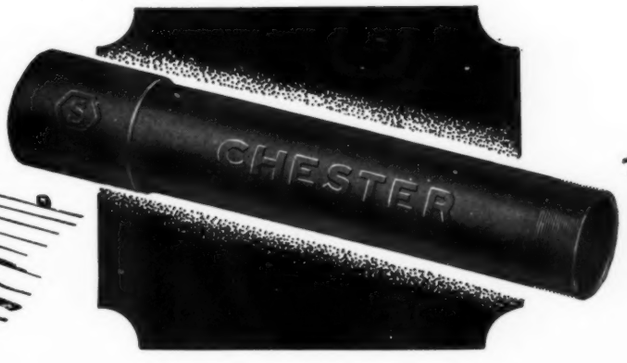
WE DON'T LIKE to "take chances" with the things *we* buy—and we don't expect our customers to take chances with the pipe we sell. That's why Chester pipe is given a seven-fold inspection to predetermine its ability to "stand up and deliver" in the field.

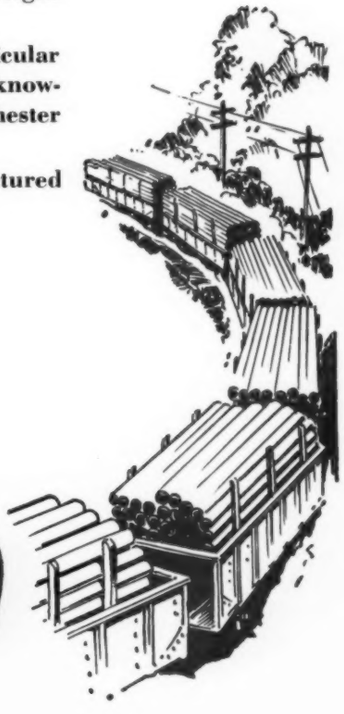
First comes Hot Inspection in the welding department; Hot Bed where the pipe is weighed; Crop End Test to determine metal quality and strength of weld; Shop Inspection where threads are gauged and taper and pitches are checked. These tests are followed by the Hydrostatic Test—the Final Inspection of surface, field end and couplings—Weight Checking and Shipping.

So, you see, when it comes to pipe we're as particular about knowing what we're *selling* as you should be in knowing what you're *buying!* That's why when you specify Chester you'll *continue to specify Chester!*

Chester also makes "Wrought Iron" pipe—manufactured from genuine old-fashioned hand puddled muck bar.

SOUTH CHESTER TUBE COMPANY
Chester, Pennsylvania





CHESTER

STEEL CASING AND LINE PIPE

on the string direct and a stiff socket used. After the change the recovery approached 100 percent. Sinker bars are being employed only when there is a possibility of the barrel sticking in a caving hole.

The experience gained by operating cable tool core barrels in the Mid-Continent and Texas fields has led to establishing a set of rules that, when followed, should provide the maximum efficiency from this tool. These rules[1], are:

1. See that the hole is in the best possible condition; that it is bailed clean and is free from iron. The best results can be obtained by using a sand pump.

2. Fill the hole with fluid until the tools are covered. This allows the valves to function properly, which is very necessary.

3. Inspect the barrel and valves to see that everything is as it should be.

4. Place the barrel in the same position as a bit and use a stiff socket. Place the jars on top of a regulation drilling stem and drilling jars. The reason for the stiff socket is that the core barrel has to be run with a slower drilling motion than a bit and also a little slacker line than when a regular bit is used. If a swivel socket were used it would allow the line to take up and let out while coring and keep the core barrel from working uniformly while the core is being taken. If there is a possibility of the hole caving, an 8-ft. sinker bar should be run on top of the jars to allow enough weight above the jars to loosen in case they should stick.

5. After running the barrel to bottom do not pick it up more than three ft. after getting a pick-up off bottom, otherwise the inner barrel will be lifted off bottom and any cavings in this inner barrel will be forced to the top when the barrel is set on bottom again. This may plug the valve on the inner barrel and the coring results will be very unsatisfactory.

6. After finding bottom, hitch on the same as when drilling with a bit. Then let the screw out until the jars are felt to part on the down stroke. Run from 20 to 30 strokes per min., depending on the depth and condition of the hole. If the hole is more than 1500 ft. in depth, it is better to place the wrist pin in the second hole. If the formation is exceptionally hard, run with a little tighter line. One trouble observed is that the operators are afraid to run on the barrel although the core barrel will stand very hard usage. When running a core barrel with bits of 4⅝ in. gauge, it is suggested that the bits should not be run after they are ⅛ in. out of gauge, as there is very little clearance on this size barrel and it is likely to get stuck.

7. Be sure to examine the valves and see that they are clean after each run.

Under ordinary conditions, the cable tool core barrels will make hole about ten percent slower than during straight drilling. Yet in a well near Skellytown, Texas, a core barrel cut dolomite almost as fast as a bit and the recovery was almost 100 percent. An example of good coring time at Drumright, Oklahoma, was the recovery of cores of 39 ft. 2 in. of shale and Layton lime from 1503 ft. to 1543 ft. in 17 hours and 30 minutes actual drilling time.

[1]These rules were formulated by R. C. Glover, Baker Oil Tools, Inc.

World Power Conference, September 7-12

EMINENT authorities from 15 countries so far have submitted papers dealing with gas for the Third World Power Conference. Gas and the gas industry will be featured both in the writings and discussions of the conference. The conference will meet in Washington, September 7-12, with an estimated 3000 representatives of 48 nations attending for a discussion of "The National Power Economy."

Of the 18 subjects set forth for consideration on the program, three deal with gas. Some 35 papers have been received thus far on the gas topics.

These topics are: Paper No. 1—"Development and Utilization of Power Resources;" Paper No. 6—"Organization of the Production, Distribution, and Transportation of Natural and Manufactured Gas;" Paper No. 12—"Conservation of Petroleum and Natural Gas."

Paper No. 1 will be in the form of a world inventory, presenting statistics on the use and extent of power resources, including gas.

Paper No. 6 will deal with the various sources from which gas is obtained for industrial and public service uses, with the production of such gas and with the transportation and distribution of that portion not used by the producer.

The organization of the coal carbonization and petroleum refining industries, both of which produce gas as a by-product, will be dealt with in papers on the coal and gas industries respectively. Organization of the gas utility industry also is treated in another paper.

Paper No. 12 will review the facts respecting conservation of oil and gas, the extent to which conservation is necessary, the extent of waste, methods of refining, and plans for conservation.

Papers for the United States are being prepared by the American Gas Association, Judson C. Dickerman of the Federal Trade Commission, and the United States Bureau of Mines.

Papers on the subjects dealing with gas have been received from the following countries and authors: Argentina—Ing. Enrique P. Canepa and Humberto F. Morrone, Kurt Kassler, affiliated member of the Argentine Engineers Society and engineer of the Cia. Primitiva de Gas, Adolfo Niebuhr, president, Argentine committee; Austria—Federal Ministry for Commerce and Traffic; Belgium—M. Lassalle, director general, Ste. de Distribution de Gas, Brussels; Canada—Canadian National Committee; China—Electric Utility Regulation Board, National Geological Survey of China; Czechoslovakia—Dr. J. Tichy, chemist, Central Electric Power Utility, Ervenice, Dr. Ing. F. Kneidl, councellor, Ministry of Public Works; Denmark—Copenhagen Municipal Lighting Department; France—Auguste Boril, Jules Meny, Etienne Genissieu, chief engineer of roads and bridges; Germany—Dr. Ing. E. H. F. Lenze, Dr. R. Nubling assisted by Dr. Ing. W. Roelen, Dipl. Ing. W. Stockle, Dr. H. Kurz, Dipl. Ing. W. Wunsch, Dr. W. Leisse assisted by Dr. Ing. Balzer; Great Britain—R. W. Hunter, M. Inst. Gas. E., chief engineer, The Gas Light & Coke Company, Dr. G. W. Anderson, F. I. C., of the engineering staff, The Gas Light & Coke Company, Sir John Cadman, G. C. M. G., chairman, Anglo-Iranian Oil Company, Frederick Brown, London School of Economics & Science; Holland—Association of Gas Producers, Prof. Dr. Ir. K. Th. van Iterson, director state mines; Hungary—Sz. Hankiss, chemical engineer, P. Kuzaila, M. E., A. Becsey, M. E., Zs. de Galocsy, M. E., B. Janois, M. E.; Japan—H. Kikuchi, Department of Communications; Norway—Norwegian National Committee, Norwegian Gas Works Association; Poland—Polish National Committee; Russia—B. E. Weitz, professor; Switzerland—H. Zollikofer, general secretary Swiss Association of Gas and Water Engineers.

THE WILDCAT'S FRIEND:

At least fifteen important oil and gas fields have been discovered with the Johnston Formation Tester. It enables the operator to test every formation easily, quickly, and at nominal expense. Many strings of casing which would ordinarily have been set to test questionable showings have been saved by the use of the Johnston Tester. There is no excuse for setting casing on a wet sand or for passing up production when a Johnston Tester is available.

EXCLUSIVE FEATURES OF THE JOHNSTON FORMATION TESTER*

The Trip Valve invariably differentiates between a test and a drill pipe leak. The Equalizing Valve (fully covered by patents), which enables the easy removal of the packer, eliminates dangerous strains on your equipment.

RECORDED DEPTH PRESSURES

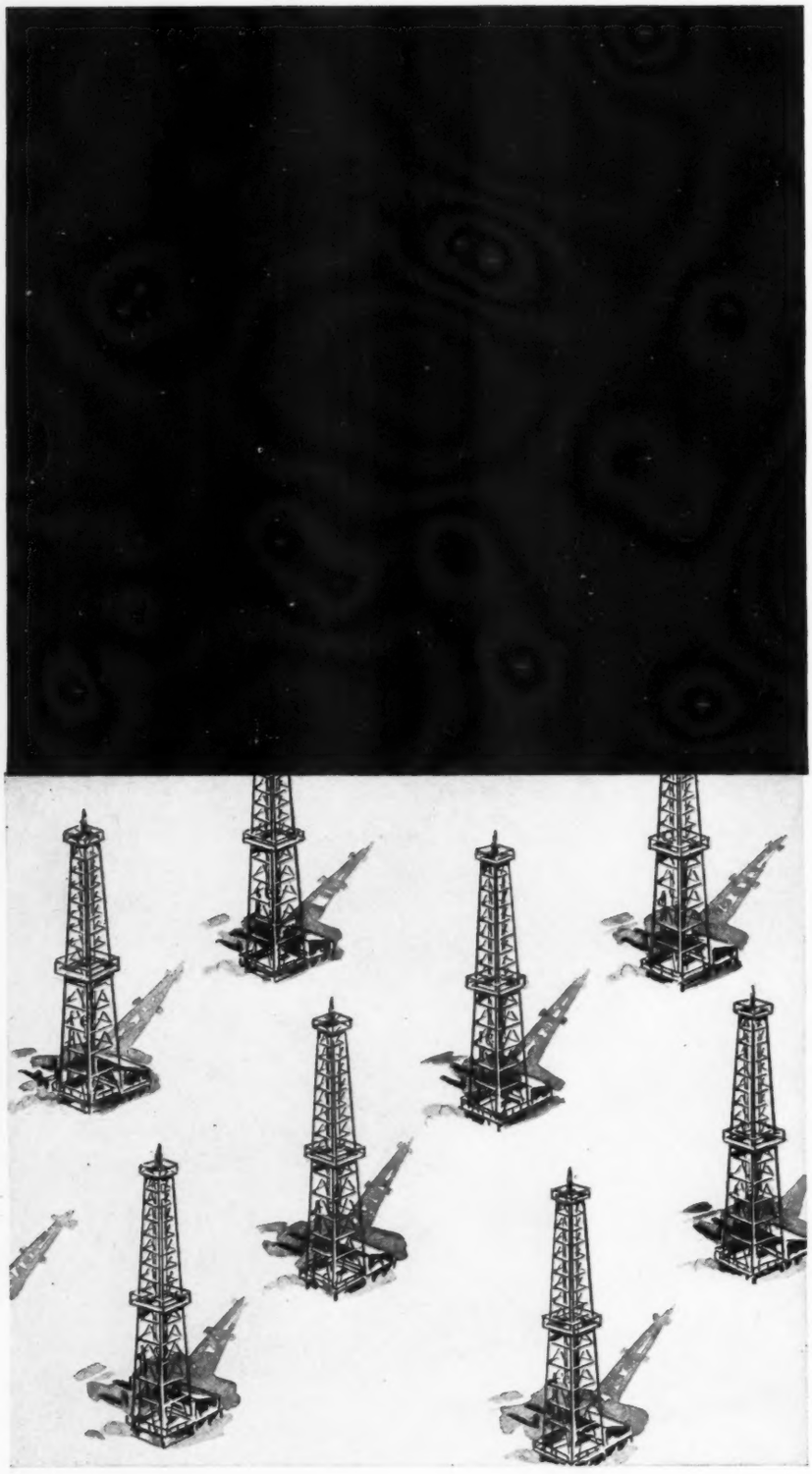
Accurate depth pressure Recorders are run as a regular part of the Johnston Formation Testing service. All recorders are checked regularly in our modern calibrating laboratory. No gauge is better than its calibration.

Why Set casing *before you know*

M. O. JOHNSTON OIL FIELD SERVICE CORP.

3117 San Fernando Road
Los Angeles, Calif.
PHONES: Los Angeles AL-0186
Bakersfield 2794, Ventura 5621

*Fully covered by U. S. Letter Patents 1790424, 1709940, 1715504, 1844270, 1901813. Other patents are pending.



AS the world's largest producer of alloy steels for oil field service, Republic is constantly striving to produce better steels for definite applications—steels which will help you set new standards in drilling.

If you have a problem in drilling... if you are looking for better steels for reamer bodies, bits, swivels, shafts, chains, gears, or other severely stressed applications, if you would like to know what is new in oil field steels, write to Department PT. Republic Metallurgists, abreast of every development and alert to every trend in production methods, will be glad to discuss definite problems with you.

REPUBLIC STEEL

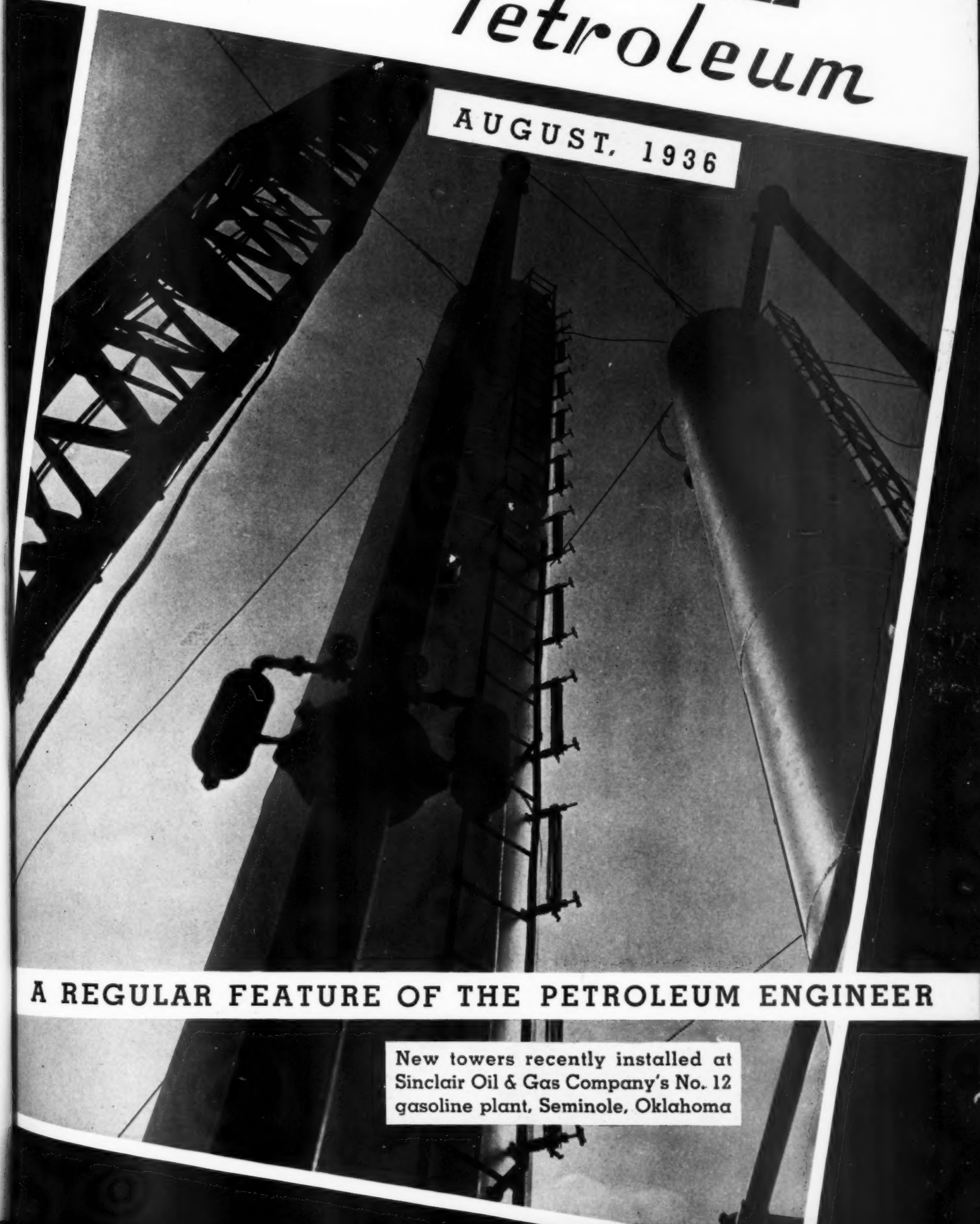
Republic Steel CORPORATION

ALLOY STEEL DIVISION, MASSILLON, OHIO
GENERAL OFFICES: CLEVELAND, OHIO

When writing Republic Steel Corporation for further information, please address Department PT.

PICTORIAL Petroleum

AUGUST, 1936



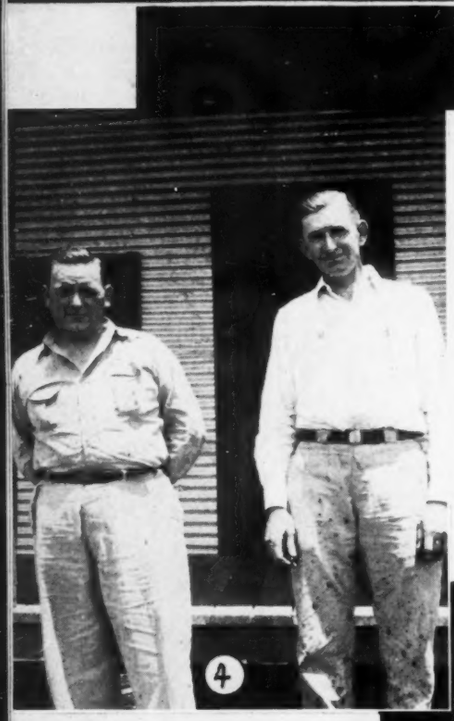
A REGULAR FEATURE OF THE PETROLEUM ENGINEER

New towers recently installed at Sinclair Oil & Gas Company's No. 12 gasoline plant, Seminole, Oklahoma

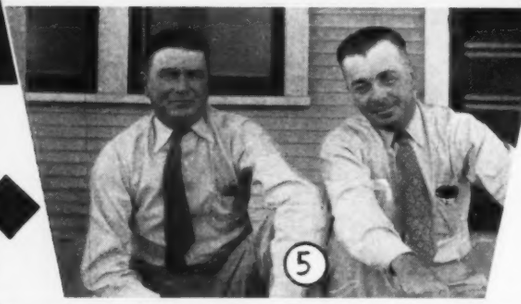
1

2

3



4

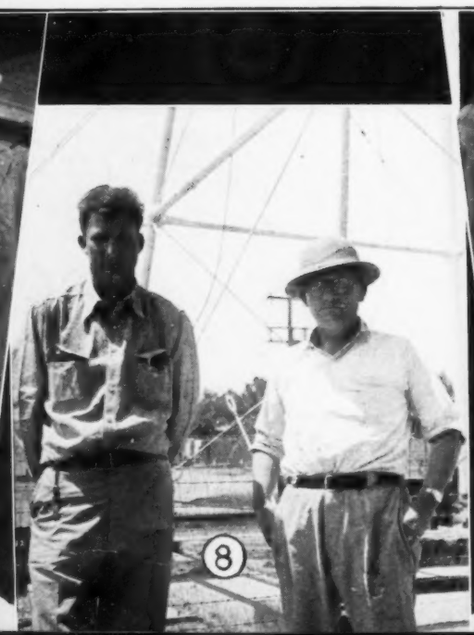


5

6

1. Albert Gackle, drilling superintendent for Herschbach Drilling Company, Hobbs, New Mexico.
2. Left to right—A. Parker, tool pusher, Gulf Production Company, Wickett; John Piery, Williamsport Wire Rope Company, Odessa; A. E. LeClaire, Mid-Continent Supply Company, Monahans.
3. C. E. Rushing, drilling superintendent, Humble Oil & Refining Company, Wink, Texas.
4. J. V. Chapman, field clerk, and J. E. Lowe, farm boss, Amerada Petroleum Company, Monument, New Mexico.
5. D. D. Bodie (left), division superintendent, Empire Gas & Fuel Company, Hobbs, New Mexico, and W. P. (Red) Knight, representative for Rector Well Equipment Company, Midland, Texas.
6. Mr. and Mrs. Kenneth Craver snapped in West Texas while enroute to the West Coast on a business and pleasure trip. Mr. Craver is one of the owners of Thornhill-Craver Company, Houston, Texas.
7. Left to right—J. Perkins, district superintendent; J. E. Heston, district petroleum engineer; and D. D. Bodie, division superintendent; all with Empire Gas & Fuel Company, Hobbs, New Mexico.
8. J. D. Exner (left), tool pusher, and J. P. (Pat) Ruckman, district superintendent, both with Humble Oil & Refining Company at Hobbs, New Mexico.
9. Left to right—H. G. Ullom, driller; W. L. Garrett, tool pusher; George W. Clark, tool pusher, all with Noble Drilling Company; and W. B. Smith, farm boss, Amerada Petroleum Company, Kermit, Texas.

7



8

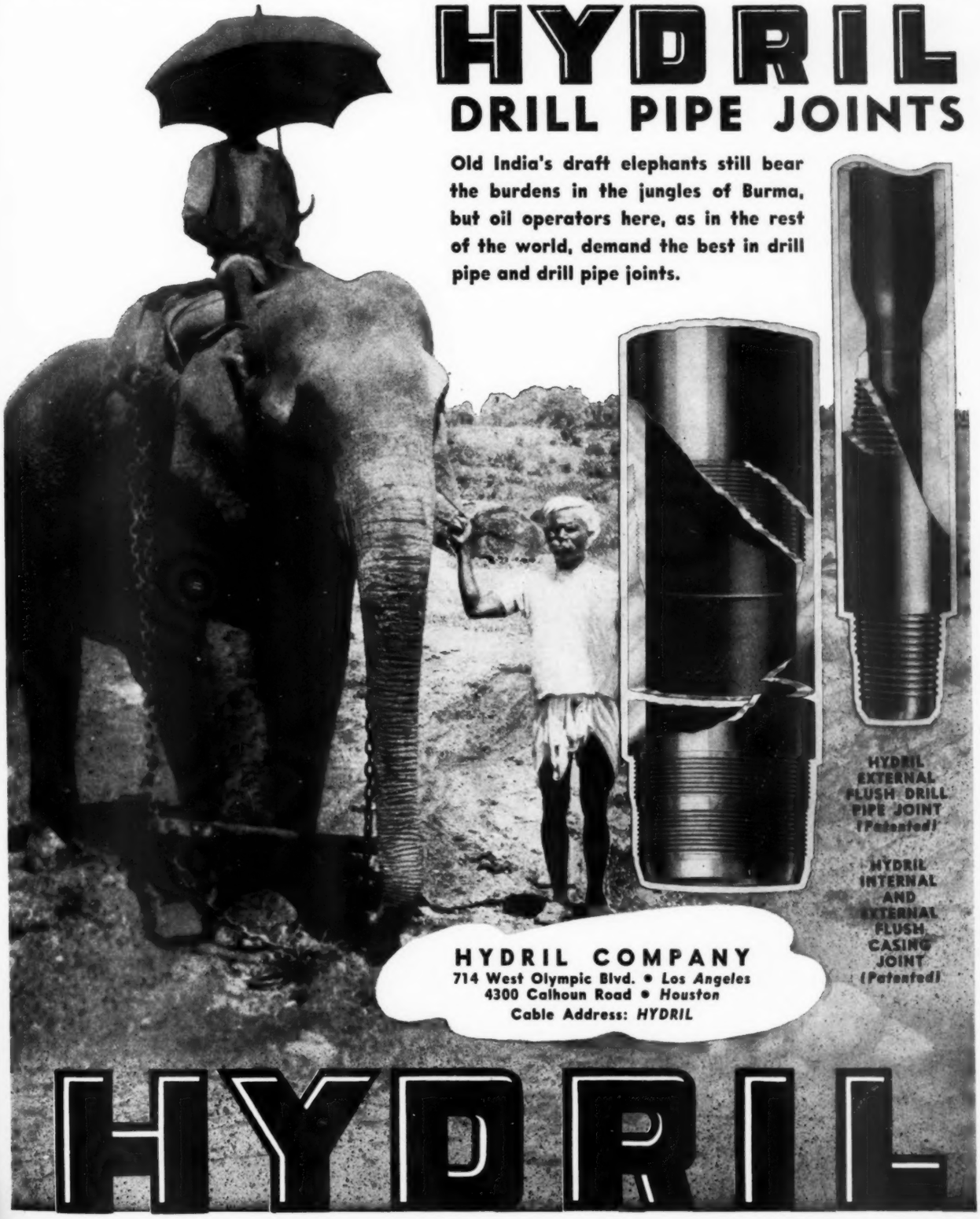
9

On the Road to Mandalay . . .

Wells are being drilled deep under the IRRAWADDY RIVER with

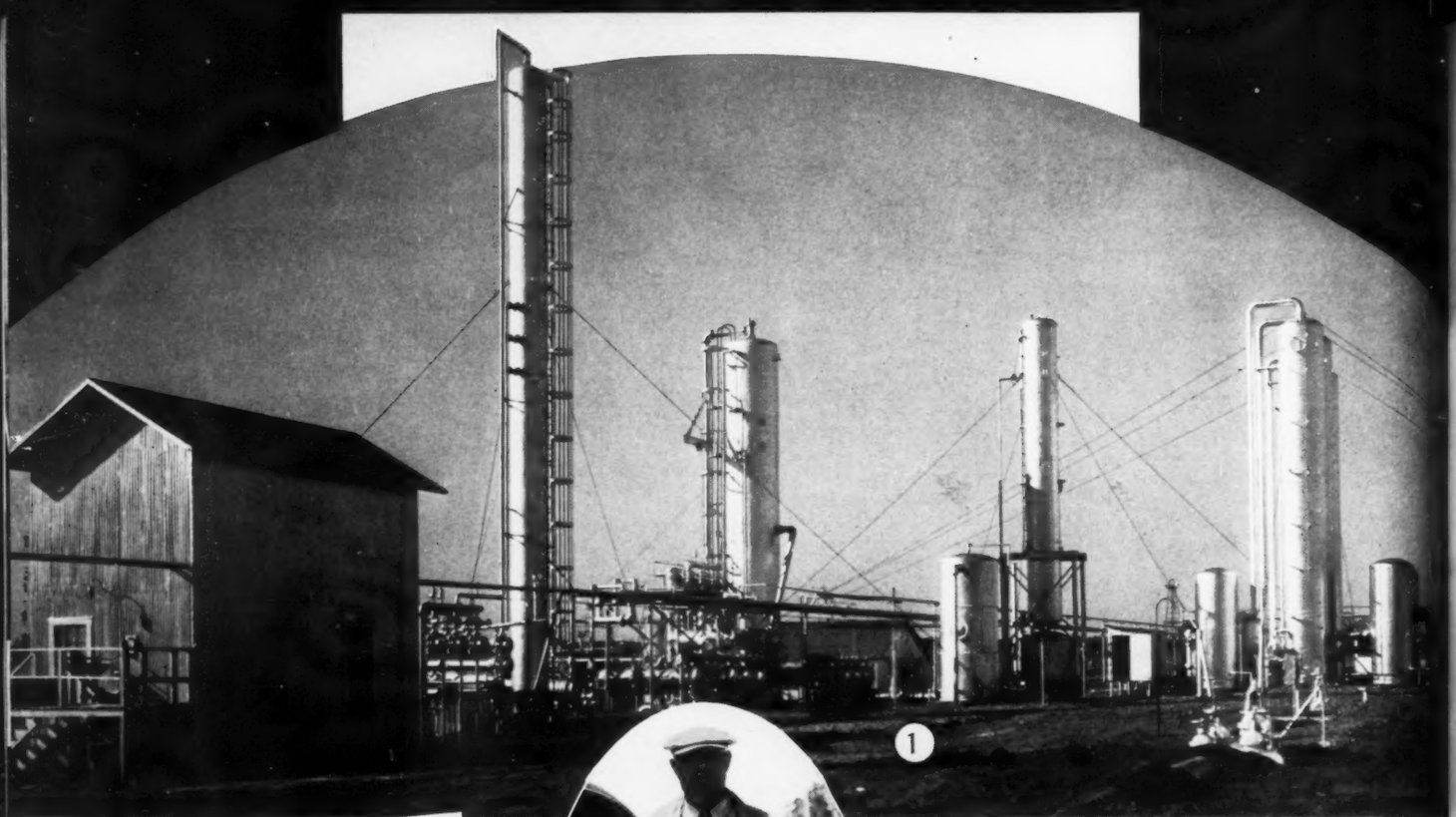
HYDRIL
DRILL PIPE JOINTS

Old India's draft elephants still bear the burdens in the jungles of Burma, but oil operators here, as in the rest of the world, demand the best in drill pipe and drill pipe joints.

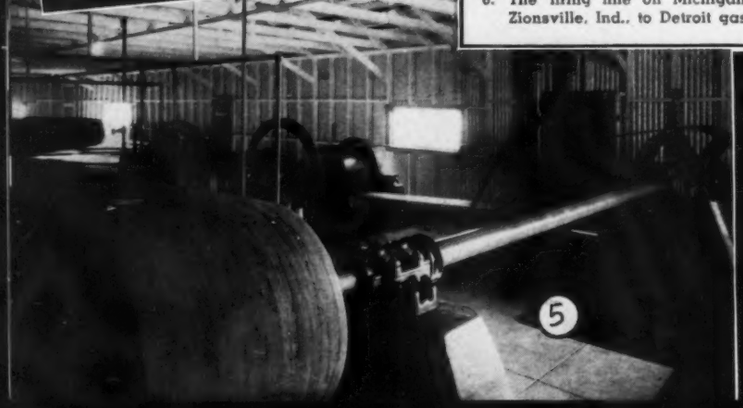


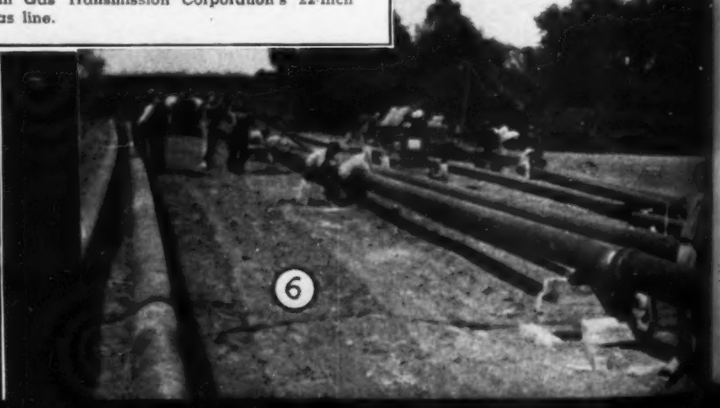
HYDRIL COMPANY
714 West Olympic Blvd. • *Los Angeles*
4300 Calhoun Road • *Houston*
Cable Address: *HYDRIL*

HYDRIL

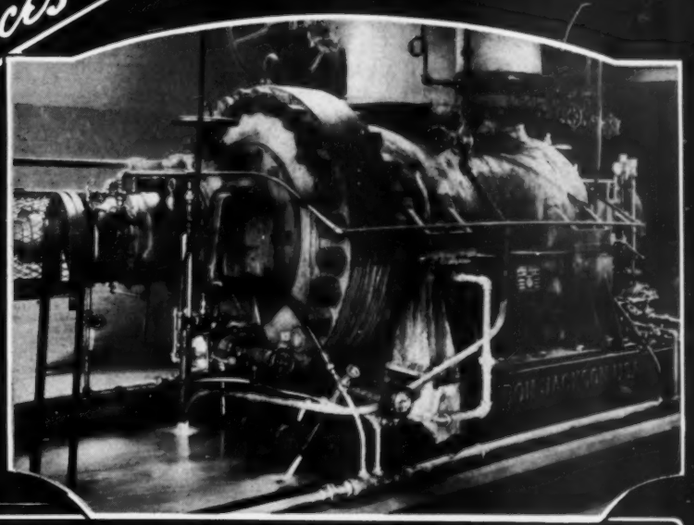


1. One of the first natural gasoline plants built in the Fitts Pool, Oklahoma, was Carter Oil Company plant, distillation unit of which is shown here. The plant has handled 43 million feet and has a maximum capacity of about 50 million feet. Gas in the field is very lean and recovery runs from 40 to 70 gallons per thousand.
2. National Separator on Barnsdall Oil Co.'s Phillips No. 1, discovery well of the Flour Bluff Pool near Corpus Christi, Texas. Eleven miles from production this was the twenty-sixth consecutive producer drilled by Charley Jacobson, Barnsdall superintendent, shown in the photograph.
3. W. D. Dolan, superintendent of Sinclair-Prairie gasoline plant at Shamrock, Okla. Mr. Dolan has been connected with Sinclair's gasoline department for more than 17 years. Photo courtesy D. S. Deem, Fulton Iron Works.
4. Electric welding at the Mississinewa river crossing on Michigan Gas Transmission Corporation's 22-inch line from Zionsville, Ill., to Detroit.
5. West Shafer power of Skelly Oil Company, Skellytown, Texas. The power is a national and the engine 120 hp. Twin Superior. The belting was furnished by Happy Belting Co.
6. The firing line on Michigan Gas Transmission Corporation's 22-inch Zionsville, Ind., to Detroit gas line.





Byron Jackson introduces



HOT OIL CHARGING PUMP

THIS PICTURE tells a dramatic story of engineering achievement. The photograph was taken in the cracking unit of the Atlantic Refining Company at Point Breeze, Pa. It shows a new type of dual driven high pressure Byron Jackson Hot Oil Charging Pump actually photographed while delivering 1350 GPM hot oil at a pumping temperature of approximately 700 degrees F. and having a discharge pressure of 1100 pounds gauge.

In this installation considerable saving was effected in both first cost and power economy over a conventional dual drive unit. The turbine driver, connected through a jackshaft coupling at one end of pump, is much smaller in rated horsepower than the motor connected through a jackshaft coupling at opposite end The motor normally drives the pump, the turbine serving only as a standby in the event of electric power failure.

One 1000 HP, 3 phase, 60 cycle, 2200 volt, 3600 RPM squirrel cage induction motor drives the pump in normal operation. For starting purposes, to bring the unit on stream or in the event of power failure, a 250 HP non-condensing steam turbine handles the necessary load. Both steam and electric drives are permanently connected to the pump; when the motor is pulling the load, the turbine is rotating at the same speed and when the turbine is pulling the load the motor is rotating at the turbine speed.

In the event of power failure, when the speed drops to 2500 RPM, the turbine governor automatically begins to function, admitting the full steam supply to the turbine, which then takes the necessary load at a constant speed of 2500 RPM. At this speed the pump discharges against a pressure of approximately 750 pounds gauge, which affords sufficient circulation of oil through the system to prevent coking of the tubes in the furnace. When the power supply is re-established the motor is started and the turbine automatically cuts out.

This installation is effective also for such emergencies as loss of tower pressure, in which event the motor can be cut out by pressing a button. A substantial reduction in cost of starting equipment for the motor is gained, as this type of unit is always started with the turbine and therefore an across-the-line type starter can be used instead of an expensive automatic reduced voltage compensator.

SINCE 1872

BYRON JACKSON CO.

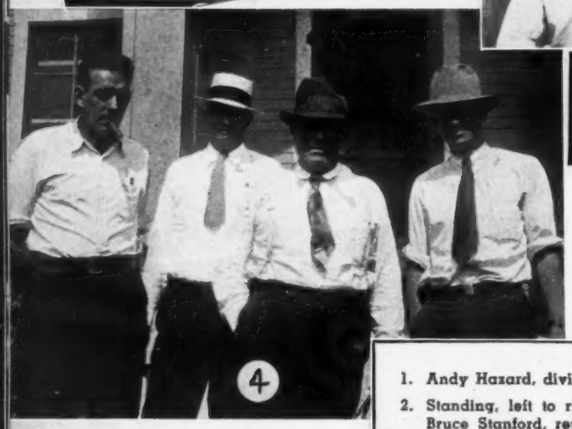
AND SUBSIDIARY

BETHLEHEM, PA.

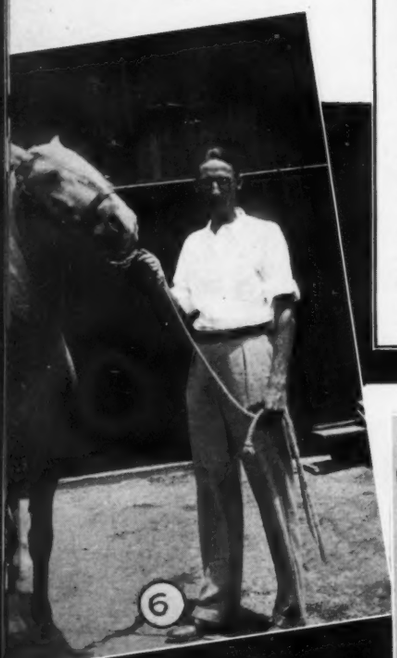
BERKELEY AND LOS ANGELES, CALIF. SALES OFFICES: NEW YORK - FORT WORTH

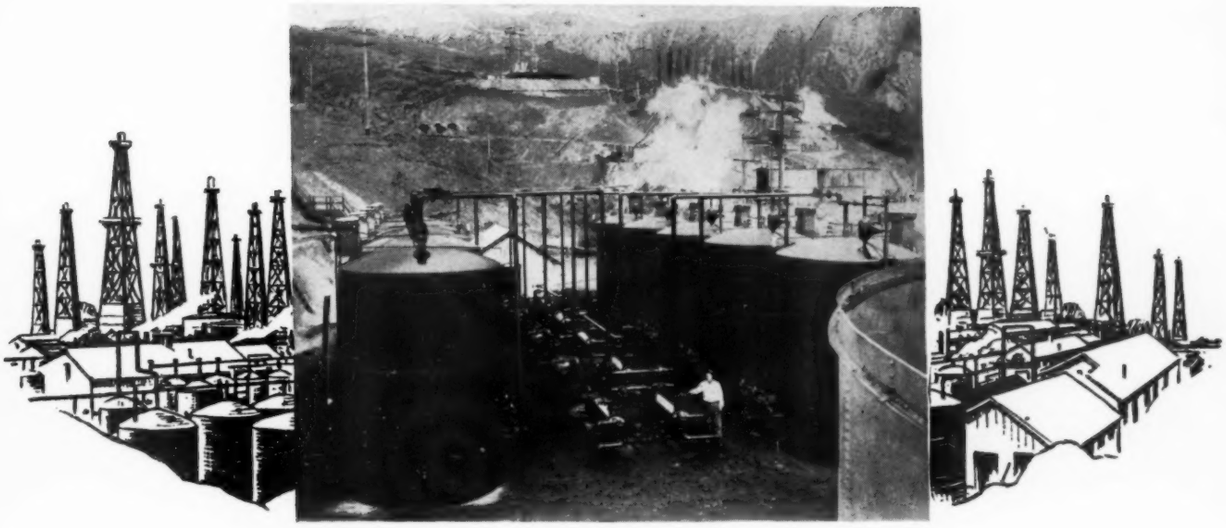
BYRON JACKSON

CENTRIFUGAL PUMPS FOR EVERY SERVICE



1. Andy Hazard, division superintendent, The Shell Oil Company, Long Beach.
2. Standing, left to right—"Brigham" Young, Specialty Oil Tool Company, Brea; Bruce Stanford, representative for Don Shaffer Tool Company, Los Nietos; Joe Shell, representative for Petroleum Equipment Company, Montebello; Bob Kees, assistant superintendent, The Texas Company, Santa Fe Springs. Bottom row—Dick Hendricks, representative, S. R. Bowen Co., Los Angeles; Milo French, superintendent, The Texas Company, Santa Fe Springs; Gene Sutton, representative, Globe Oil Tools, Inc., Los Nietos; and William H. Kohler, service man, Globe Oil Tools Co.
3. Bert Clearwater, superintendent, George F. Getty, Santa Fe Springs.
4. Left to right—A. C. Stone, petroleum engineer; A. W. Sands, assistant superintendent; J. A. Moller, division superintendent; and J. A. Bermingham, Jr., petroleum engineer, all with The Texas Company at Long Beach.
5. Backfilling at Huntington Beach with a Dodge Coupe.
6. Don Weaver, field manager, Wilshire Oil Co., Norwalk, who is a fancier of good horses as well as a good oil man.
7. M. A. Machris (left), general supervisor, and T. B. Gates, general refinery superintendent, Wilshire Oil Co., Norwalk.
8. B. O. Dawson, petroleum engineer, George F. Getty, Santa Fe Springs.
9. J. B. Kitt, owner of Signal Pipe Line Construction Company, Long Beach.





Perpetual Modernization
assures unimpaired performance

Obsolescence long has been a factor of major importance to the oil operator. Modernization—the improvement and replacement of equipment to insure maximum efficiencies and economies, is essential to profitable petroleum production and has cost the industry millions every year.

As with other types of equipment and processes, vast strides are continuously being made in the art of dehydration due to the research and development work carried on by the Petreco engineering and laboratory departments. However, Petreco Electromatic Dehydrators purposely are designed so that all such improvements and developments can be applied to plants already in service, regardless of types and operating conditions; thereby permitting operators to maintain plant efficiencies and economies in perfect step with the most modern dehydrating practise over long periods of time at a fair and reasonable cost.

Minimized obsolescence is one of the most outstanding features of Petreco Electromatic Dehydration. It permits perpetual modernization without exhorbitant penalties. There have been few instances where this bug-bear of modern industry has been so well controlled from the viewpoint of the user.

The Petreco plant shown above is an example of maintained performance characteristics over long periods of time. Installed more than a decade ago, it has been operating continuously ever since. Subsequent improvements in the art of dehydration are applicable to such plants at reasonable cost, assuring peak performance without excessive penalty.

PETROLEUM RECTIFYING COMPANY OF CALIFORNIA

General Offices: 530 West Sixth Street, Los Angeles, California

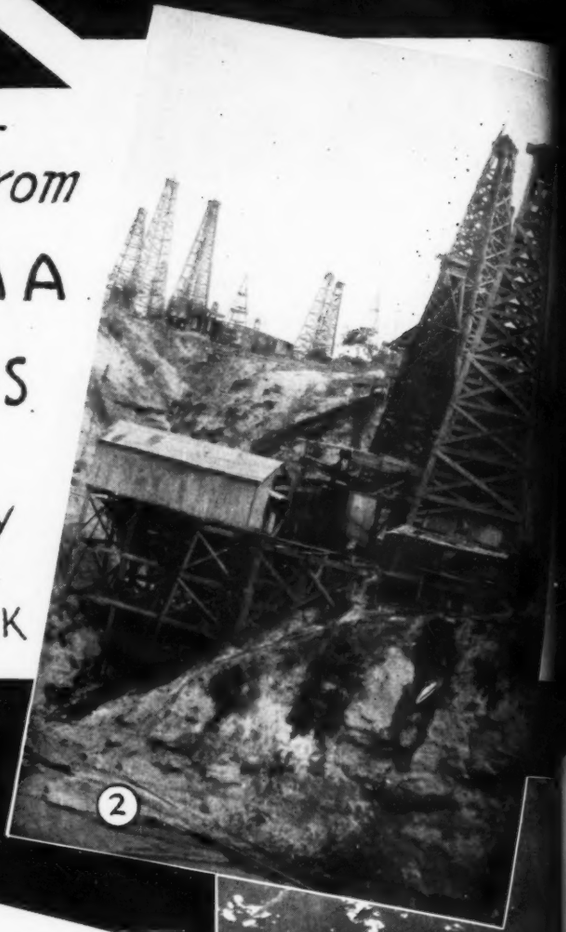
Branch Office: Houston, Texas • Branches and Service Men in Principal Oil Fields

PETRECO

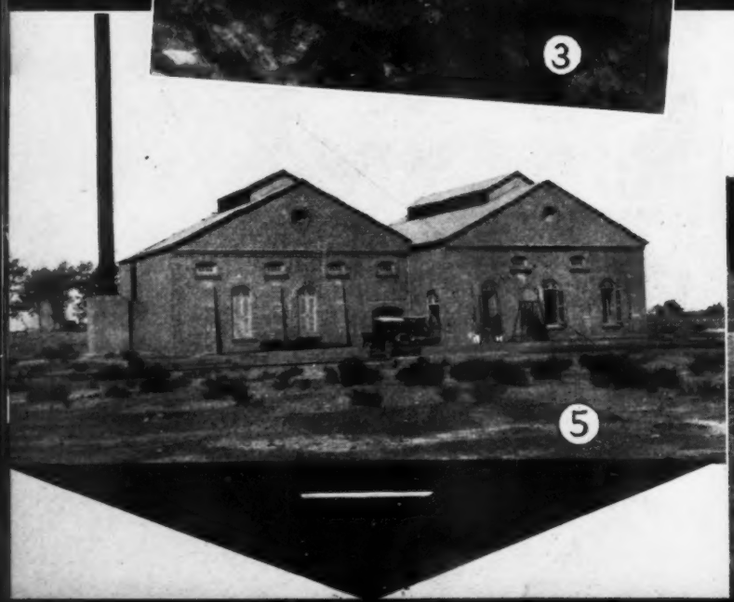
Peak Performance Economically Maintained

Scenes from the Burma Oil Fields

Reproduced by Courtesy of
BERT R. EMRICK



1. Spooling a wire line in Burma.
2. One of a number of motor houses set on trestles in the Yenangyoung field.
3. A pumping rig built inside a rotary drilling rig in a Burma oil field.
4. Bert Emrick, set for a 300-yard drive.
5. Oil line pump station at Khaur.
6. Transporting a boiler by elephant power.



BETTER CEMENT JOBS WITH AQUAGEL CEMENT

In cementing casing, field experience has shown that AQUAGEL-Cement is advantageous because:

1. There is no shrinkage in AQUAGEL-Cement. It acquires its final set in exactly the same volume as at the time it is poured.

2. AQUAGEL-Cement is more waterproof than neat cement. The colloidal matter in AQUAGEL fills all pore spaces.

3. AQUAGEL-Cement is not contaminated by mud or water in the hole which may thin and weaken ordinary cement. Therefore, AQUAGEL-Cement does not channel like neat cement.

4. AQUAGEL-Cement remains pumpable longer than neat cement. Even after prolonged delays, AQUAGEL-Cement can easily be pumped into place.

5. AQUAGEL in cement holds all cement particles in place as mixed, making a homogeneous slurry which is much more uniform in strength than neat cement. Neat cement settles, leaving free water toward the top of the slurry.

6. AQUAGEL-Cement saves money not only by producing better jobs, but because higher water ratios can be successfully used, a saving in the quantity of cement results.

7. AQUAGEL-Cement, even though it appears thick, is easier to pump than neat cement. This is due to the lubricating qualities of the AQUAGEL.

8. The Gel in AQUAGEL-Cement prevents it from flowing away into porous or creviced formations.

9. When the same water cement ratio is used, AQUAGEL-Cement is as strong, or perhaps slightly stronger, than neat cement.

AQUAGEL-Cement can be made by first mixing the AQUAGEL with the water to be used; or by using slightly more AQUAGEL, the same advantageous results can be obtained by mixing dry at the same time the cement and water are mixed.

A TRUE AQUAGEL-CEMENT

A true AQUAGEL-Cement contains no free water and has a steep angle of repose. Proper proportions of AQUAGEL, water and cement must be used to procure these advantageous results.

OVER STRINGS

of casing have been successfully cemented in one field in Oklahoma using an 8½ gallon per sack water ratio (75% slurry) and 4% of AQUAGEL MIXED DRY WITH THE CEMENT AND WATER. *This procedure has shown a saving of as much as 400 sacks of cement per job.*

AQUAGEL-CEMENT IS VERY EFFECTIVE IN PLUGGING CREVICES AND RESTORING LOST CIRCULATION

BAROID
Extra-heavy Colloidal Drilling Mud

AQUAGEL
Double-proof Colloidal Drilling Mud

STABILITE
An Improved Chemical Mud Thinner

BAROCO
An Economical, salt water-resisting Drilling Clay

FIBROTEX
An effective material for preventing or retaining lost circulation in drilling wells

Stocks Carried and Service Engineers Available in all Active Oil Fields

BAROID SALES COMPANY

LOS ANGELES • TULSA • HOUSTON

NATIONAL PIGMENTS & CHEMICAL COMPANY, ST. LOUIS

PAUL D. TORREY has been placed in charge of the office recently opened in Houston, Texas, by Sloan and Zook Company of Bradford, Pennsylvania. He will be assisted by Clark F. Barb. The office is at 923 Shell Building.

FRED R. ALLNUTT has resigned as managing director of the Clarendon Petroleum Company, Ltd., English subsidiary to the Tide Water Oil Company, to become managing director of European operations for the Alliance Oil Corporation.

J. A. DeLANOY, director of purchases for the Asiatic Petroleum Corporation and Anglo-Mexican Petroleum Corporation in New York, returned to his headquarters early in August following a three-months' sojourn in Europe.

CARL E. REISTLE, JR., resigned as chairman of the East Texas Engineering Association and on August 1st joined the staff of the Humble Oil and Refining Company. His headquarters are in Houston.

SAMUEL F. PRATT, recently appointed European manager for the Pennsylvania Grade Crude Oil Association, sailed for London, England, July 29th to assume the duties of his new post. **S. A. HARTWELL, JR.,** who has been European representative, will return to headquarters at Oil City, Pennsylvania, in the fall.

W. C. RALSTON, who has been in the employ of the Magnolia Petroleum Company for 38 years, has resigned as superintendent of the company's refinery at Corsicana, Texas. **J. W. FOLMAR,** who has been assistant general superintendent of the Beaumont refinery, succeeds him.

J. M. COURTNEY has been made superintendent of the newly-created Rodessa, Louisiana, district for the Magnolia Petroleum Company. He has been superintendent of the Union district, Arkansas. **R. A. MILLER,** formerly farm boss in the Longview, Texas, district, is the new superintendent of the Union district.

H. L. McQUISTON, division superintendent at Oklahoma City, Oklahoma, for the Phillips Petroleum Company, resigned as of August 1st to become associated with the Clymore Company of San Antonio, Texas. He is succeeded by **JAMES STEPHENS,** who has been local superintendent, and **TOM J. HAMILTON** has been transferred from western Kansas to Oklahoma City to succeed Stephens. **FRED W. SHELTON,** who has been assistant to Stephens, has been sent to Great Bend, Kansas.

JOHN TOLIVER of Wink, Texas, has been added to the petroleum engineering staff of the Humble Oil and Refining Company at Midland, Texas. **R. A. ESTES** has joined the engineering staff at Midland, coming from Houston; and **W. E. DOUGHERTY,** of the geological department, has been transferred from Houston to Midland.

DON De VITO, independent operator, has transferred his headquarters from Roswell, New Mexico, to Midland, Texas.

FRANK BASS, superintendent in the Thompsons district of Texas for the Humble Oil and Refining Company, has been placed in charge of the Heyser district. **TOM BOUNDS,** who has been assistant division superintendent in the East Texas division, takes charge of the Thompsons district. **SID MOOR,** who has been assistant division superintendent in the Gulf Coast, succeeds Bounds. **W. J. BROWN,** formerly superintendent of the West Beaumont district, succeeds to Moor's vacated post; and **CHARLES H. KEEN** has been transferred from the Tomball district and made superintendent of the West Beaumont district.

L. E. DEAN, field manager of North American Oil Consolidated, Inc., Los Angeles, California, recently toured the fields of Oklahoma, Texas, and Louisiana.

F. G. RAPPOPORT, British Controlled Oilfields, Ltd., London, is now back at headquarters following a visit to company holdings in Venezuela.

RICHARD H. MORRISON, who has been general manager of the California Company in Texas and who recently was made vice-president in charge of production of the newly-formed California-Texas Oil Company, Ltd., has left Dallas for San Francisco for a series of conferences before assuming his new duties. His headquarters will be in New York City and he will be in charge of all production activities of the new company.

C. O. RISON, district superintendent for the I.T.I.O. at Oklahoma City, Oklahoma, has been transferred to eastern Colorado and is in charge of the company's wildcat tests in that area.

W. A. JONES, who has been production foreman for the Carter Oil Company at South Burbank, Oklahoma, is now stationed at Oklahoma City.

R. P. PADEN, electrical supervisor for the Atlantic Pipe Line Company, Dallas, Texas, has been made general superintendent of the company. He succeeds to the post made vacant last November when **J. HARRY WOOD** was appointed vice-president and general manager following the death of R. W. Howe. **W. S. SCHMIDT,** Dallas, has been made assistant general superintendent.

DR. J. A. L. HENDERSON, of New Brunswick Gas and Oilfields, Ltd., London, England, is visiting Canada and the United States.

T. P. THOMPSON, Bradford, Pennsylvania, has been re-elected president of the Pennsylvania Grade Crude Oil Association. Other officers re-elected are: **FAYETTE B. DOW,** of Washington, D. C., vice-president and general counsel; **JOHN A. BECK,** Pennsylvania Refining Company, Butler, Pennsylvania, vice-president; **S. MESSER,** Quaker State Oil Refining Corporation, Oil City, Pennsylvania, treasurer; **N. H. WEBER,** Pure Oil Company, Chicago, Illinois, recording secretary; **J. E. MOORHEAD,** Oil City, Pennsylvania, executive secretary, and **S. A. HARTWELL, JR.,** assistant secretary.

● The driller who can save $1500.00 on one well is not necessarily a "super man." He represents any driller on a deep well that is equipped with the Parkersburg Hydromatic Brake. Statements from operators who have checked its results say that this brake pays for itself in one 10,000′ well.

Typical of its performance is the report from one driller who says: "After running 8,000′ of 6″ drill pipe the brake drums were only slightly warm." It also does away with hazardous working conditions caused by smoking brake drums and eliminates all danger of runaway loads. Operators also like the economy of its operation. There are no moving parts to wear out and it will give years of efficient, trouble free service.

If you are not already using the Hydromatic Brake it will pay you to get the complete story. Just ask your Parkersburg representative about this "short cut" to reduced drilling costs.

THE PARKERSBURG RIG AND REEL COMPANY

PARKERSBURG, WEST VIRGINIA

Dallas Houston Tulsa New York Los Angeles

PARKERSBURG HYDROMATIC·BRAKE

LAUGH WITH BARNEY

Edited by BARNEY HORRIGAN

Her father fumed and raged; her mother fussed and wept. And all little Nell would say, sobbingly, was: "I can't tell you his name. I simply can't!"

And so it came to be accepted that with all her faults, Nell was a loyal little soul, to be pitied, not blamed.

Came at length a visiting cousin.

"I know it's all very loyal and novelette-ish and that sort of thing," said the cousin, "but I can't see what good it does, Nell. Why don't you tell your dad his name?"

"I've never said I won't," sobbed Nell. "I've only said I can't."

* * *

Bill: "Do you think there is any real advantage in being cross-eyed?"

Belle: "I certainly do. Last night Cross-eyed Pete asked me to have dinner with him in a restaurant and, believe it or not, when the waiter laid the check on the table Cross-eyed Pete reached for the mashed potatoes."

* * *

A perplexed porter was explaining an unprecedented situation to the Pullman conductor.

"But," said the conductor, "the stepladder's missing; who took it? And how? And why?"

"Ah sure don't know, but she's gone," responded the porter.

At this time, the country boy, who was occupying an upper berth for the first time overheard the conversation, parted the curtains, stuck out his head and shouted:

"For gosh sakes, Porter, here, take mine. I won't need it till morning."

* * *

She: "Do you think a cannon can cause enough vibration to cause rain?"

He: "Well, I can't say as to that, but I've seen a shot gun bring on a shower."

* * *

She: "Something tells me you know the quickest way to a girl's heart."

He: "Sure, but I always like to detour first."—*Western Reserve Red Cat.*

* * *

"I've been arrested before, your honor," said the old maid when brought into court, "but I've never been tried."

* * *

First Cutie: "Why do they compare the Sultan to a P. W. A. worker?"

Second Cutie: "Because he always takes his pick and then falls asleep."

He: "I'm going to kiss you for one thrilling, wonderful hour."

She: "Say, aren't you forgetting yourself?

He: "Well, no. I dare say it'll be a certain amount of fun for me too."

* * *

"Know anything about Latin syntax?"

"Don't tell me they had to pay for their fun, too?"—*Ohio Sundial.*

* * *

Teacher (in history class): "Johnny, for what was Louis XIV chiefly responsible?"

Johnny (positively): "Louis XV, ma'am."—*M. I. T. Voo Doo.*

* * *

A surgeon was performing an operation on a patient when a fire started in a warehouse across the street, illuminating the whole operating room. Having finished, the doctor said to the nurse: "I think the patient is coming to; you had better pull down the shade. I don't want him to think that the operation hasn't been a success."

* * *

Bus Repartee

A fussy old lady, traveling cross-country via bus and the great open way, finally became irked to the extent of firing a salvo at the driver because of frequent stops. "Such transportation," she boomed, "Why you stop at every telegraph pole." "Sorry, lady," said the driver, "But this bus is a Greyhound."

* * *

Sign on a field office in South Texas: "Peddlers keep out. We shoot every tenth peddler. The ninth one just left."

* * *

Brown noticed that Jones, his fellow clerk, was looking very sad and downhearted.

"Anything wrong, old boy?" he asked.

Jones nodded gloomily.

"It's my girl," he replied.

"Dropped you, eh?" asked Brown.

"No," went on Jones. "I showed her a photograph of me as a boy sitting on my father's knee—"

"Nothing wrong in that," interrupted Brown.

"No, that's what I thought," said the other, "but she asked who the ventriloquist was."

"Hello, Jim," greeted a friend. "I took an excursion to Niagara Falls over the week-end with one of your girl friends. Have you ever been there?"

"No," admitted the friend, "but I put my arm around her once."

* * *

Two men were fighting furiously in the rain. After it had continued for an hour, the fellow on top remarked to his opponent: "Do you give up?"

"No!" exclaimed the furious guy.

"Okay," piped the other, "then you get on top for a while, because I'm getting soaked!"

* * *

Visitor: "Are there any slick crooks in this city?"

Pittsburgher: "Slick crooks! Man—one evening at a dance they stole my pants and hung weights on my suspenders so I wouldn't miss them until they had gone."

* * *

Annabelle: "Harry surprised me by telling me that we're going to take our honeymoon in France."

"How nice," trilled Ada, "and how did he spring it on you?"

"He said as soon as we were married, he would show me where he was wounded in the war."

* * *

Mrs. Newed entered the dining room and proudly placed the turkey on the table. "There you are, dear, my first Christmas turkey," she exclaimed.

Mr. Newed gazed with admiration at the bird's shape.

"Wonderful, darling!" he said. "How beautifully you have stuffed it."

"Stuffed!" she echoed. "But, darling, this one wasn't hollow."

* * *

A golf professional, hired by a big department store to give golf lessons, was approached by two women. "Do you wish to learn to play golf?" he asked one.

"Oh, no," she said, "it's my friend who wants to learn. I learned yesterday."

* * *

The difference between a modern flapper and an old maid is that the modern flapper has been tried and found wanton and an old maid hasn't been tried but is still wantin'.

7 KEYS

The Baker Cable Tool Core Barrel enables you to proceed with *positive knowledge* of all factors to secure the *greatest ultimate profits* from your oil well.

Nothing need be left to chance—no guesses are necessary. Cores are *easily taken* by any experienced driller, *at low cost*, and provide complete information upon which you *can base accurate* recommendations.

You should have all details and specifications in your files. Ask for the complete Baker Catalog, or refer to pages 197 to 201 of the 1936 Composite Catalog.

BAKER OIL TOOLS, INC.

POST OFFICE BOX 77, HUNTINGTON PARK, CALIFORNIA

COALINGA • TAFT • HOUSTON • OKLAHOMA CITY • TULSA • NEW YORK

CORES

BAKER CABLE TOOL CORE BARREL

TO MAKE BETTER CHANNELS FOR ACID TREATMENT *Gun-Perforate*

NO 7

. . . OF A SERIES OF GUN PERFORATOR APPLICATIONS . . .

Says "Perforating Pete":

"Your solubility test on this limestone formation indicates that acid treatment will increase your ultimate recovery from this zone.

"This acid treating can be done right through Gun-Perforations made in your casing and cement, and done more efficiently than by any other method. And here are some of the reasons why:

"First, the bullets plowing into formation will leave behind good channels of from 1½ to 2½ inches in diameter, besides making long crevices and voids that radiate from each new channel. This increases tremendously the effective area on which the acid can start working.

"Second, remember that this is done without injury to your casing. Also that our accurate placement of Gun Perforations insures you against any breaking of . . . cement bond at the wrong place, so you needn't worry about water entry or dilution of acid later in the process.

"Third, you eliminate expensive clean-out operations and delays. Many of our preparatory jobs are acid-treated within 24 hours after Gun-Perforating. Some operators have the acid treaters on the job, ready to move as soon as we're through perforating.

"As for Gun-Perforating in open hole before acidizing, we do lots of that, too. But for safety, the formation should be hard. If it is too soft, there is danger of excessive crumbling, which may cause the gun to stick.

"To sum up, experts of the acid treating companies tell us that as a general rule, wells have responded more readily to treatment through Gun-Perforations than to any other method of handling."

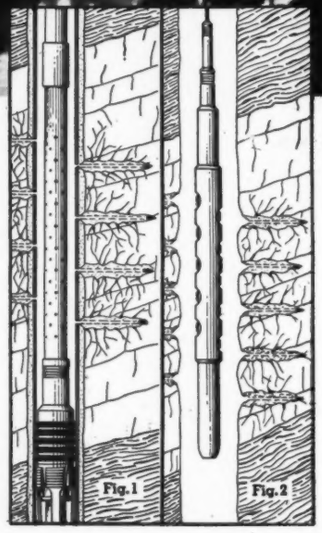


Figure 1—Shows a Lane-Wells Production Type Packer set below Gun Perforations with a perforated section of tubing above, preparatory to pumping acid through tubing and through Gun-Perforations, thus preventing the acid from dissipating in a lower or less desirable zone.

Figure 2—Shows method of Gun-Perforating in open hole, preparatory to acid treatment. . . Note bullet holes and fissures that increase the effective acidizing area.

Devices and method of operation licensed by Technicraft Engineering Corp. under Patents No.—1,562,184; 2,029,454; 2,029,478; 2,029,490; 2,029,491; 2,033,562; 2,043,340; 2,043,341; 2,043,400; 2,043,401.

Tomorrow's Tools - Today!

THE **LANE-WELLS** CO.

Gun Perforator Service

LOS ANGELES, CALIFORNIA • NEW YORK CITY, NEW YORK

THE LANE-WELLS CO. OF TEXAS • HOUSTON & CORPUS CHRISTI • THE LANE-WELLS CO. OF OKLAHOMA • OKLAHOMA CITY & TULSA

MACHINERY and EQUIPMENT

Automatic Pressure Compensator

IN measuring the flows of compressible fluids such as steam, air and gas, variations in the static pressure of the flow directly influence the flow reading. To prevent errors from this

source, The Foxboro Company, Foxboro, Massachusetts, has developed the Automatic Pressure Compensator for Foxboro flow meters.

The Automatic Pressure Compensator mechanism is shown in the illustration. It is merely a simple spiral pressure tube connected to a lever.

As the line pressure changes, the spiral adjusts the multiplication of the linkage between the float and pen arm. This is not an additive correction but a percentage correction; the linear amount of correction differs at different points of the chart and is calibrated to fit the flow formula of the meter.

Thus a continuous, instantaneous, and accurate compensation for pressure changes is obtained automatically. The Foxboro Automatic Pressure Compensator is sensitive, too, and will correct the position of the flow pen for a change in pressure as small as 1/10 of 1 percent, the makers state.

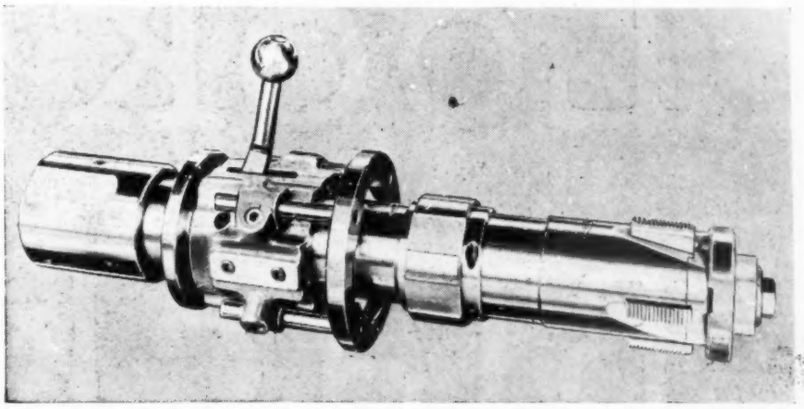
At zero flow, pressure changes do not affect the position of the flow pen; at all other points on the chart the shift in pen position is just sufficient to compensate for the effect of this factor in the flow formula. On square-root flow scale meters the pen position is varied proportionately to the change in absolute pressure; on uniform flow scale meters, pen position is varied proportionately to the square root of change in absolute pressure.

Should maximum flow and maximum pressure occur simultaneously, the pen will not travel beyond the upper chart limit.

If at any time a pressure-compensating meter is changed over to a service where compensation is not required, the meter is easily adapted to the new service. By attaching one screw on the compensator to the mounting post in the instrument, the compensator becomes inoperative and the differential calibration is that of a non-compensating meter.

The Automatic Pressure Compensator does not affect the inclusion of pens for recording pressure or temperature.

Collapsible Tap Involves Use of Pilots



THE Landis Machine Company of Waynesboro, Pennsylvania, has recently marketed a collapsible tap of interesting design involving the use of pilots to insure concentricity of the thread being tapped with other parts of the casting.

The accompanying illustration shows such pilots applied to a Landis Style LT collapsible tap. The body of the tap is of special length to reach to the bottom of a deep hole in a steel casting tractor part. The pilot ahead of the chasers lines up the tap with bore of the hole that is to be tapped. The rear pilot is made in the form of a collar fitting over the tap body. It fits a reamed hole near the top of the casting with which it is necessary to maintain concentricity. Both pilots are made of steel, are hardened and ground, and are made to revolve with the work in order to prevent siezing in the work.

Similar pilot arrangements suitable for the requirements of practically any type of job can be supplied with the Landis Style LT collapsible taps in all sizes from 1⅜ in. to 12 in. inclusive.

When
Things
Look
Black....*

*

.....turn to

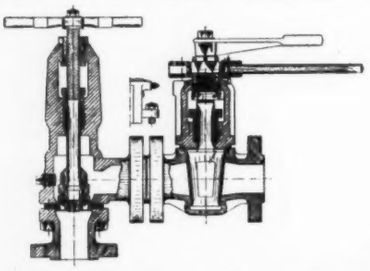
PURCHASED ELECTRIC POWER.....

it's the bright side of any Production Power Problem

PETROLEUM ELECTRIC POWER CLUB

Two-Handle Lift-Type Plug Valve

HOMESTEAD Valve Manufacturing Company, Coraopolis, Pennsylvania, announce a new valve, which, they state, incorporates in its design positive mechanical seating and unseating. It is known as the two-handle lift-type plug valve. It has been designed to overcome operating obstacles encountered with high temperatures, high pressures, infrequent operations, corrosion, etc., in power plants, steel mills, refineries, oil fields, paper mills, chemical plants, etc.



A mechanical leverage lifts the plug vertically from its seat sufficiently to break the friction between plug and body and allows for the free rotation of the plug. By the same process, the plug is mechanically reseated. To operate this valve from a closed position, the plug is first raised only slightly from its seat by means of a handle fitted and fastened into the lifting mechanism. The plug is direct connected to this lifting arrangement. By turning the handle approximately one-quarter turn counter-clockwise, a positive upward movement to a predetermined point is produced. In this position, free rotary movement of the plug is assured. The plug is then turned 90 deg. into position by its own handle. Reseating is accomplished by turning the lifting feature clockwise. Ease of operation is further assured because the lifting mechanism can be easily and thoroughly lubricated, the makers point out. The body of the valve is streamlined, which eliminates friction loss to a large degree. Pressure range is from 125 lb. and up, and temperature up to and including 750 deg. Fahrenheit. Valves for pressures up to 250 lb. per sq. in. are made of iron; for all other higher pressures they are of bronze or of cast-steel construction with alloy trim best suited for the services required.

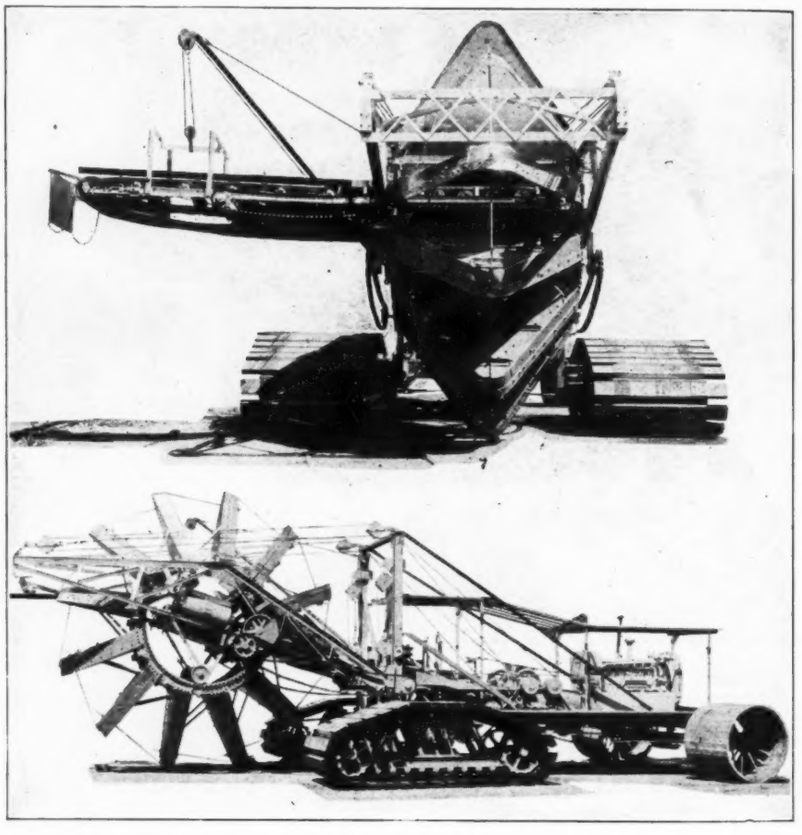
The illustration shows the new Homestead Blow-off Combination. Here the two-handle lift-type plug valve becomes the companion to the regular Hovalco Angle Blow-off Valve.

The Hovalco Angle Valve has as its most notable features that both the disc and seat are removable, reversible, and regrindable. Disc and seat are made of an alloy selected for the service in which they are to be used. The seat is not screwed into the body of the valve, but is held between the upper and lower bodies. By loosening four bolts that hold the upper body to the lower one, the seat is exposed to full view, permitting quick repair. Proper seating of the valve disc is assured because scale and sediment cannot lodge due to the free passage of liquids through the valve, the manufacturers state. Pressure range is from 125 to 600 lb. per sq. in., inclusive, and temperatures up to and including 750 deg. Fahrenheit.

The valve combination may be had in all iron for the lower pressures, and in cast-steel construction with suitable alloy trim for the higher pressures.

Buckeye Ditcher to Venezuela

A FIFTY-TON machine will soon be digging drainage ditches through swamp land in Venezuela, cutting ditch with sloping banks up to 8 ft. 8 in. wide and 5 ft. 6 in. deep at a rate of from 10 in. to 11½ ft. per minute. The machine is a specially-built Buckeye wheel-type ditcher. It travels on alligator traction wheels measuring six ft. in width, with bearing surface sufficiently large to bring the pressure down to approximately 500 lb. per sq. foot. This low bearing pressure enables the machine to travel easily over the softest swamp land muck, where a man could not walk.



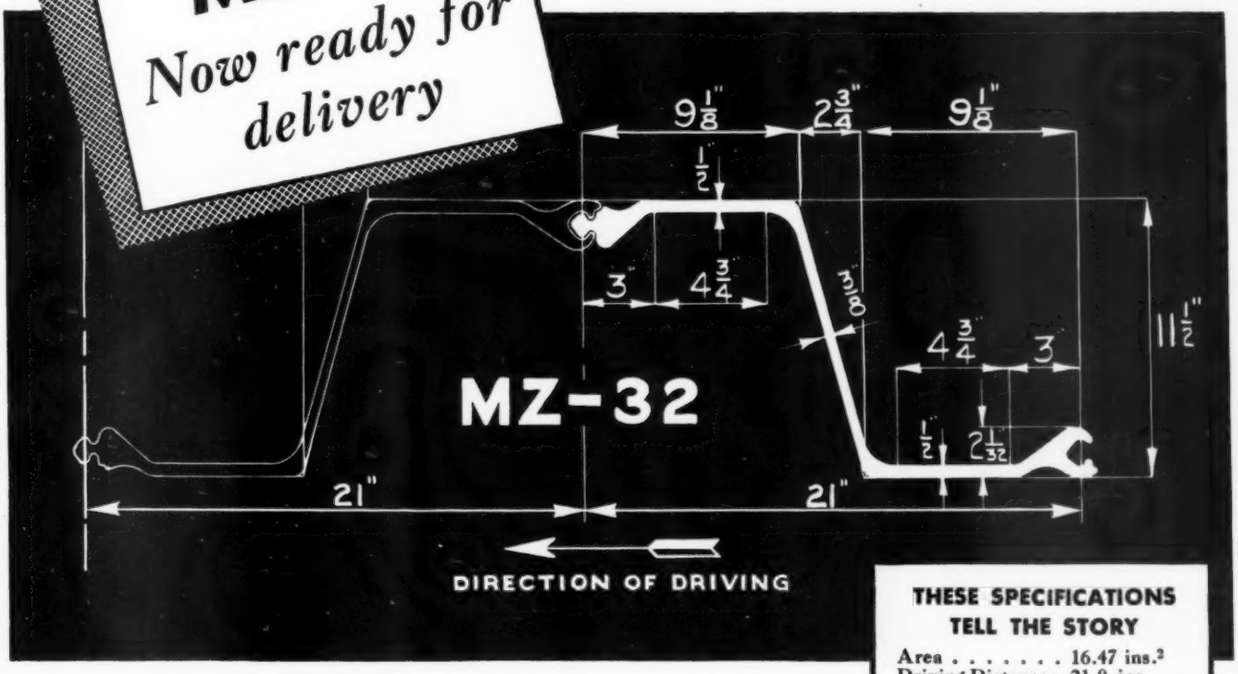
A similar machine has been used for a number of years in this same territory where development of the oil fields in Venezuela requires extensive drainage operations. Variations of this same type of machine also are used in many other countries where swamp land operations call for extensive ditching work.

In our own southern states Buckeye machines of this type have been widely used in reclaiming marsh lands.

An idea of the size of the machine may be gained from the following items from the specifications of the machine. Width, 23 ft.; height, 17 ft.; length, 49 ft.; shipping weight, approximately 50 tons. A six-cylinder Diesel motor of 125 hp. powers the machine.

Another new CARNEGIE-ILLINOIS "Z" PILING

MZ-32
Now ready for delivery



THESE SPECIFICATIONS TELL THE STORY

Area	16.47 ins.²
Driving Distance	21.0 ins.
Weight per lineal foot of pile	56.0 lbs.
Weight per square foot of wall	32.0 lbs.
Moment of Inertia	385.7 ins.⁴
Section Modulus per pile	67.0 ins.³
Section Modulus per lineal foot of wall	38.3 ins.³

For economical, lasting oil dock construction . . . offers highest beam strength compared to weight

HERE'S MZ-32, another unusually economical Steel Sheet Piling section that assures low-cost, efficient construction for wharves, piers, bulkheads, docks, sea walls, canal locks and all similar structures retaining heavy lateral loads over long spans.

Supplementing our MZ-38 Section recently introduced, MZ-32 with its very high efficiency and lighter weight assures desirable economies in construction.

Next to our MZ-38, its section modulus is the highest yet produced in this country—67.0 ins.³ per pile, or 38.3 ins.³ per lineal foot of wall . . . yet it weighs only 32 pounds per square foot of wall. The savings it offers are obvious.

Note the improved ball-and-socket interlock. Its double locking feature insures water tightness, helps to preserve alignment. Heavy concentration of metal in the triangular-shaped ball facilitates driving and permits the use of long sections in hard bottoms. Interlocks are located where the longitudinal shear is zero, thus making welding of interlocks unnecessary to prevent slippage.

An insert for our Piling Catalog fully describing MZ-32 is now in preparation. If your copy does not reach you—write us. Any further information you may require will be gladly furnished. The cooperation of our engineers in the use of these new Sections is at your service.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

Chicago
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

NATIONAL

FROM ZIONSVILLE (*near Indianapolis*) *to Detroit goes this new pipe line, the first large diameter line in recent years. It heralds the return of long cross-country pipe line construction.*

SEAMLESS

Now SERVES DETROIT WITH NATURAL GAS

Largest pipe line in recent years completed—
230 Miles of 22-Inch NATIONAL Seamless

FROM the fields of Texas, natural gas is flowing into the great automobile city of Detroit through the longest span ever covered by a gas line. The last link—230 miles of 22-inch NATIONAL Seamless—joined to the existing main near Indianapolis, is now completed and working.

From the day the first car of NATIONAL Seamless landed on the job until the last length was connected, this clean, smooth, strong pipe gave typical NATIONAL performance and once again proved its outstanding characteristics for important projects like this. Being seamless, there was no weld to worry about when strains due to bends, shocks or other severe installation difficulties were imposed. High tensile strength, ductility, long lengths, light weight, and smooth joint-making all combined to lower laying cost and facilitate completion of the job.

Remember, NATIONAL Seamless is pierced from a solid billet of steel which assures uniform wall strength, transversely and longitudinally. It is made by the largest manufacturer of seamless pipe in the world, controlling every step from ore to finished product—therefore no divided responsibility. Let NATIONAL engineers explain to you the full meaning of "Walls Without Welds."

NATIONAL TUBE COMPANY

UNITED STATES STEEL

Shovel, Crane Operator Fatigue Eliminated By New Speed-O-Matic Control

IN keeping with the trend of the times, to discover and develop means that will reduce all possible fatigue in methods of doing work, Link-Belt Company, Chicago, builders of power-operated shovels, draglines, cranes, are now announcing what is said to be a revolutionary development in the operation of such machines. It is

a power control with short, easy-throw levers, to be known as Speed-O-Matic Control. The advantages are enumerated as (1) Elimination of operator fatigue; (2) much speedier operation; (3) greater output.

In a simple analogy made by G. H. Olson, general manager of the company's shovel and crane division, the relative ease of operation of a Speed-O-Matic shovel-dragline-crane and the conventional machine was compared to the drawing of water out of a faucet by simply turning a handle, and the hand pumping of water out of a pump. In the one case the operator merely controls the flow of the water; in the other instance he actually pumps it up by his own effort. Drawing water out of a faucet requires only an easy wrist motion, as does Speed-O-Matic control; whereas pumping water by hand requires a tiring arm and shoulder motion, as does the operation of the conventional mechanical lever control system, says Mr. Olson. As the arm tires, the speed and volume of work decrease. Thus, it is pointed out how the elimination of fatigue not only performs a humanitarian duty but also speeds up all operations, and practically assures that the rate of work at close of day is as fast as at its beginning. In other words, a fraction of the power of the machine is harnessed for doing the work under the guidance of the operator, instead of requiring his doing manual labor in performing the necessary operations thousands of times a day.

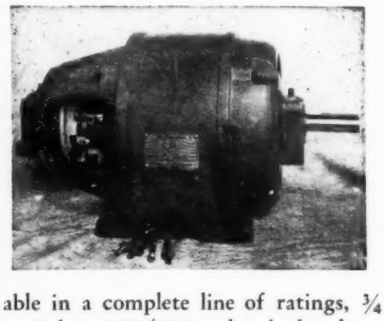
The Speed-O-Matic control is referred to as having literally no wearing parts between the cluches or brakes and the conveniently arranged control stand behind which the operator is comfortably seated, at front of cab. Even the foot pedals are operated from this seated position. The large truck type seat is adjustable both as to height and proximity to control stand.

As to maintenance costs, it is stated by the manufacturer that a Speed-O-Matic machine working alongside an exactly similar machine on levee building service for a whole year, has shown that the clutch and brake wear is so nearly negligible on the faster Speed-O-Matic controlled unit that it is believed that deterioration of material, rather than wear, will determine the life of clutch and brake linings.

Speed-O-Matic control is now supplied as standard equipment on Link-Belt shovel-dragline-crane models K-40, K-45, K-48, and K-480.

Single-Phase Induction Motor

ESPECIALLY designed for heavy industrial duty, a new single-phase repulsion-start induction motor is announced by Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pennsylvania. The new Type CR motor has high starting and pull-in torques that make it particularly suitable for such applications as pumps, compressors, etc. It is avail-



able in a complete line of ratings, ¾ to 3 hp., 110/220 volts dual voltage for operation on all commercial frequencies.

The Type CR motor starts as a repulsion motor and, because of the high torque developed, rapidly overcomes the relatively high inertia load to which this type of motor is usually subjected, and comes up to speed in a very short period of time. At approximately 60 percent of synchronous speed, the armature is short circuited by a centrifugally-operated device, and the motor continues to operate as a squirrel cage induction motor. This results in a constant speed, irrespective of the load.

The motor is essentially a heavy duty motor. All cast parts are of heavy section with shafts and bearings of liberal proportions. All mechanical and electrical features have been designed with the intention of producing a general purpose single-phase motor that will give long life and trouble-free operation even under the unfavorable operating conditions that frequently exist on applications where this type motor is used.

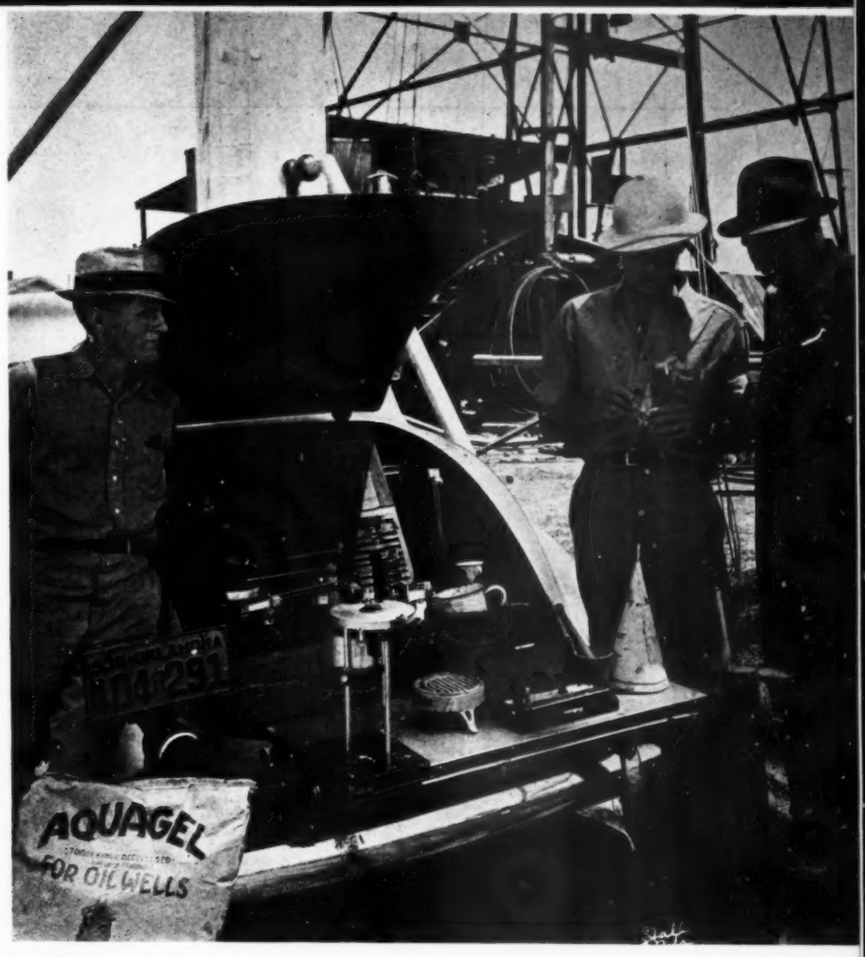
IT PAYS TO KNOW!

BAROID SERVICE ENGINEERS ENHANCE THE VALUE OF BRIDGEPORT DRILLING MUD SERVICE

To aid Bridgeport customers in obtaining the best results at the least cost from their mud investments, and to assist them in quicker, safer and more economical drilling, the makers of Baroid, Aquagel and other mud products distributed by us, maintain scientifically equipped testing laboratories at strategic points in the Mid-Continent and Gulf Coast where Chemical Engineers draw the hidden physical secrets from drilling muds.

Baroid Service Engineers, with laboratory equipped cars in every field, apply this valuable information to the solution of your drilling mud problems, right at your well, without one penny's cost or the slightest obligation to you.

This service and that of our field men is available to Cable Tool and Rotary Operators in any field. To obtain it quickly, simply phone the handiest Bridgeport or Baroid representative in your vicinity.



RAPID, EFFICIENT SERVICE

Bridgeport Drilling Mud Stocks are located in, or adjacent to, all active Mid-Continent and Gulf Coast fields for quick delivery service on single sacks, carloads or more. Carload shipments direct from the factory are made in quick time to any point.

Telephone
"station-to-station" from anywhere at anytime

Use our Drilling Mud Products, the services of our field men and those of Baroid Engineers to Aid in Casing Recovery; to Reduce Pipe Pulling Time; to Prevent Caving and Sticking of Tools and Pipe; to Prevent Pipe Corrosion; to Prevent Loss of Circulation; to Combat the Effects of Temperature in Deep Holes; to Reduce Cementing Costs; to Control Fluid and Gas Pressures; to Maintain Correct Visosity of Muds; to Resist the Action of Salt and Salt Water; to Close Cavities and Crevices; and in many other ways to aid in Quicker, Safer and More Economical operating.

• • •

THE BRIDGEPORT MACHINE COMPANY
GENERAL OFFICES AND WORKS: WICHITA, KANSAS
Eastern and Export Office: 30 Rockefeller Plaza, New York City

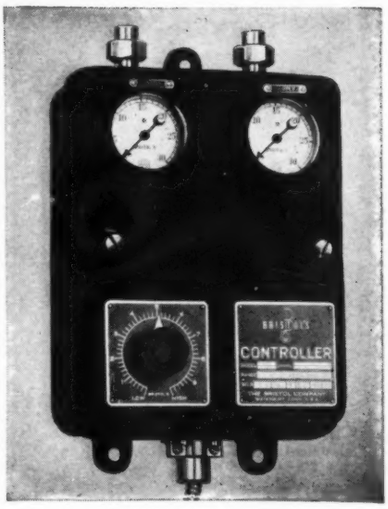
BRIDGEPORT
OIL FIELD EQUIPMENT
WICHITA · HOUSTON
TULSA · DALLAS
OKLAHOMA CITY · SAN ANTONIO
NEW YORK CITY · SHREVEPORT
AND BRANCH STORES

AQUAGEL	BAROID	STABILITE	BAROCO	FIBROTEX
Trouble-Proof Colloidal Drilling Mud.	Extra Heavy Colloidal Drilling Mud.	Improved Chemical Mud Thinner.	Economical, Salt Water-Resisting Drilling Clay.	Cavity and Crevice Filler.

Recorder-Controller With Wide-Range Sensitivity Adjustment

THE BRISTOL COMPANY, Waterbury, Connecticut, announces a new series of pneumatic-type controllers known as Ampliset Free-Vane Controllers. These instruments are now available for automatically controlling temperature, time-temperature, flow, liquid level, pressure, time-pressure, and humidity. The Ampliset principle also has been combined with the Metameter, a system of telemetering recently announced by this company for the remote control of steam pressure and gas pressure.

Bristol's Ampliset controllers operate on the basic free-vane principle employed by the Bristol Company for many years and widely used in industry. In the Ampliset controller certain features of field adjustability have been added to the time-proved free-vane system, whereby its sensitivity can be changed by means of a small screwdriver to fit exactly the lag peculiarities of the process on which it is used. The controller has great versatility. It enables the user readily to adapt it to meet conditions not readily anticipated.



Since the free-vane system is used, which requires practically no power from the measuring element to operate controlling mechanism, the chart record is always accurate, the manufacturers state.

The sensitivity or throttling range of the instrument can be changed without removing the chart or chart dial. It can be changed without disturbing in any way the operation of the controller or upsetting the operation or equilibrium of the process, it is stated. By making the same adjustment that regulates the sensitivity of the Ampliset controller, the instrument can be changed from direct-acting to reverse-acting or vice versa. This change is made simply by turning the scale on the adjustment past the zero point.

This new instrument is described in Bulletin No. 440, free upon request.

No. 36 Seismograph Drill

Sullivan Machinery Company, Michigan City, Indiana, announces a new truck mounted Seismograph drill designated as the No. 36. This drill is a complete light weight highly portable drilling unit utilizing the truck motor for power through a power take-off. Has capacity to take 2-in. core to depths of 800 ft. or drill 5-in. shot holes to 500 feet.

Features stressed are hydraulic feed with unique single lever control, two-speed transmission, independent control of drum and rotary, hydraulically raised mast of welded airplane type tubing and ability to use a kelley or gravity feed as desired. Chuck size is large enough to pass 2⅜-in. (N) drill rods.

For further particulars write Sullivan Machinery Company, Dept. 136, Michigan City, Indiana.

It took just 7 questions & 7 answers...
TO SELL ME ON THE NEW CHIKSAN ALUMINUM DOCK HOSE.
● Question: Is it light?
● Answer: A complete 50 ft. 6 in. discharge and suction hose weighs only 500 lbs.
● Question: Will it corrode?
● Answer: The aluminum alloy construction resists salt water corrosion.
● Question: Is there danger of fire?
● Answer: It eliminates fire hazards due to hose failure and is non-sparking.
● Question: What cargoes is it good for?
● Answer: It is capable of handling all petroleum products.
● Question: Will it do the work with safety?
● Answer: It has a 500 pound safe working pressure.
● Question: Does it have long life?
● Answer: This hose is designed to give many years of service without showing appreciable wear.
● Question: Is it flexible?
● Answer: Swivel parts rotate on double row ball bearings and are Alemite lubricated.
Chiksan
CHIKSAN OIL TOOL CO. LIMITED
FULLERTON, CALIFORNIA — GULF ENGINEERS INC. HOUSTON, TEXAS
NORTHWEST DISTRIBUTOR E. C. GRIFFIN 101 9th AVE NORTH SEATTLE, WASH.

New Instrument Transformers

SEVERAL new lines of current and potential instrument transformers, in voltage ratings of from 23 to 161 kv. and suitable for oil or Pyranol filling, have been announced by the General Electric Company, Schenectady, New York. Sizes and weights have been reduced, and insulation factors increased in the new transformers, it is stated.

Current Transformers

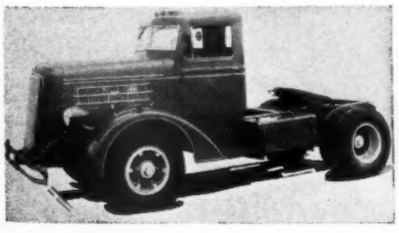
In the new current transformers the primaries are wound on porcelain spools, which serve as the main part of the insulation between the primary and secondary circuits. The 23- and 34.5-kv. transformers each have one porcelain-spool unit; for 46 kv. and above each transformer has two or more porcelain-spool units connected in cascade. The current transformer element is mounted in a shallow base and extends up into a porcelain shell, which is used as the high voltage bushing.

Potential Transformers

The new potential transformers are designed for use only on three-phase, four-wire grounded systems. They replace the single-bushing, conventional type. In the lower voltage classes, 69 kv. and below, the units consist of a single core-and-coil assembly mounted in a shallow tank and extending up into a porcelain shell that serves as the high voltage bushing. In voltages above 69 kv., the transformer consists of two or more core-and-coil units, mounted vertically and connected in cascade.

FWD Announces the T-40 Truck

A NEW 40,000 lb. gross capacity tractor truck, designed to meet the requirements for a compact high-



speed unit for heavy duty hauling is announced by the Four Wheel Drive Auto Company of Clintonville, Wisconsin, and Kitchener, Ontario, Canada.

This unit meets the ever-increasing trend in regulations that restrict the length and axle weight of tractor and trailer units, the manufacturers state. This ability to better comply with regulations is said to be due to the more equal weight distribution made possible by setting the front axle back 53 in. from the front bumper. The weight distribution of the tractor is 40 percent on front axle and 60 percent on rear. The manufacturer states that the new tractor truck with semi-trailer is designed to carry a gross of 40,000 lb. distributed 10,000 lb. to the front axle of the tractor, 15,000 lb. to the rear axle of the tractor, and 15,000 lb. on the axle of the semi.

According to the manufacturer, controlled power, provided by the better distribution of power and load through the use of a center differential and set-back front axle, is the key to the truck's capacity for high-speed hauling.

★

Ask About

OTIS

Removable Bottom Hole Chokes and Mixing Valves, and about Drilling-in Under Pressure Control or, Carrying Additional Pump Pressure on the Mud Column or, Use as a Square Kelly Blow-out Preventor with the . .

OTIS

Square Kelly Drilling Head. (Patented)

★

RUN or PULL TUBING or DRILL STEM UNDER PRESSURE WITH OTIS CREWS and EQUIPMENT

Pipe has been handled in many hundreds of wells under tremendous surface working pressures, and packers have been landed under pressure at depths as great as 8800 feet, by our highly trained crews working with specially designed, fully patented OTIS equipment and methods.

OTIS SERVICE eliminates the necessity of placing mud on the sand and thus injuring your well.

We maintain crews and equipment in or near Mid-Continent, Gulf Coast and Eastern high-pressure fields, available on a reasonable daily basis with mileage from our nearest headquarters.

OTIS PRESSURE CONTROL, Inc.

Tower Petroleum Bldg. . . . Dallas, Texas

HOUSTON, TEXAS
MIDLAND, TEXAS
OKLAHOMA CITY, OKLA.
HOBBS, N. M.
ADA, OKLA.

Lucey Opens New Store at Rodessa

Better to serve the oil industry in North Louisiana, Lucey Products Corporation has opened a new store at Rodessa. Complete stock of parts for all Wheland-Lucey rotary drilling equipment, production equipment, line pipe, supplies, and hardware will be carried. District offices will be established at Shreveport, Louisiana, and R. E. Giddens, long associated with the company's headquarters at Tulsa, is district manager.

Fred Stone to Europe

Fred Stone, chairman of the Hydril Company, is en route to Europe on a combined business and vacation trip. Accompanied by Mrs. Stone, he left Los Angeles by steamer late in July bound for the Panama Canal. He will

FRED STONE

make a number of stops in the oil fields of Colombia and Venezuela, later proceeding to London, England. After a short stay in London, Mr. and Mrs. Stone will tour the British Isles, Norway, Sweden, and the Continent, returning to London early in October, where they will remain for several weeks. Stone expects to be back in his office after November 1st.

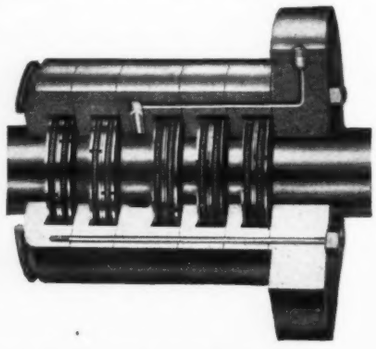
Buy Control Crosby Steam Gage and Valve Co.

Carl F. Woods and George F. Felker, president and vice-president, respectively, of the Crosby Steam Gage and Valve Company for the past 12 years, have purchased the entire common stock of the company.

The company's nozzle safety valves are being manufactured under license in the British Isles by Crosby Valve and Engineering Company, Ltd., of London, and on the Continent by Societe Anonyme des Etablissements Jules Cocard of Paris. Crosby Steam Gage and Valve Company, Inc., of California is a wholly owned subsidiary.

More Evidence that . .

COOK'S METALLIC PACKINGS



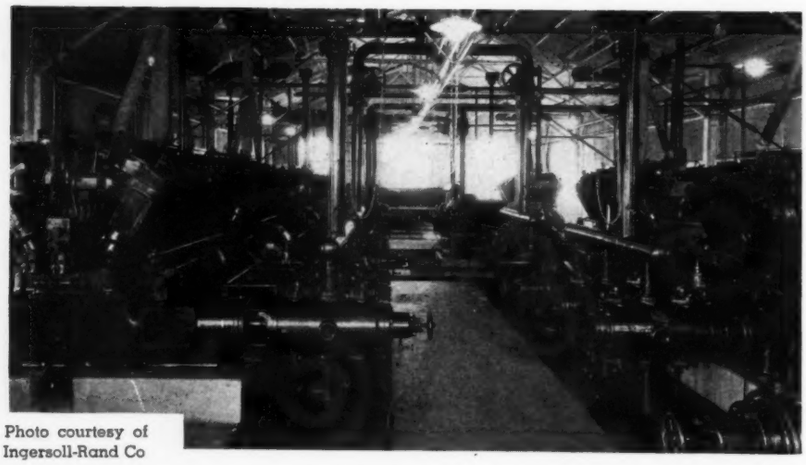


Photo courtesy of Ingersoll-Rand Co

. . . PREDOMINATE IN THE NATURAL GASOLINE INDUSTRY

"Sealing Pressure Since 1888"

Any engine or compressor is a more efficient unit if its rods are fitted with COOK'S Metallic Packing. A noteworthy application is represented by Ingersoll-Rand Gas Engine Driven XVG Compressors — like those shown above — that come factory-equipped with COOK'S Compressor, and Oil Return Packings.

WRITE FOR INFORMATIVE LITERATURE . . . SPECIFY MAKE AND TYPE COMPRESSOR YOU OPERATE

C. LEE COOK MANUFACTURING CO.

New York Cleveland Los Angeles Baltimore INCORPORATED LOUISVILLE, KY. Chicago Tulsa New Orleans San Francisco

E. W. Stuart Joins BJ Organization

E. W. (Buster) Stuart is now a member of the Byron Jackson sales department and will cover the Corpus Christi and adjacent South Texas areas upon his return from a visit to the main BJ plant in Los Angeles.

E. W. (BUSTER) STUART

Stuart is well known throughout the Gulf Coast territory, having previously represented the Nowery J. Smith Supply Company, and Bettis Sales Company.

F. N. Dillman Made Sales Engineer Pittsburgh Equitable

The Pittsburgh Equitable Meter Company, Pittsburgh, Pennsylvania, announces the appointment of F. N. Dillman as sales engineer.

F. N. DILLMAN

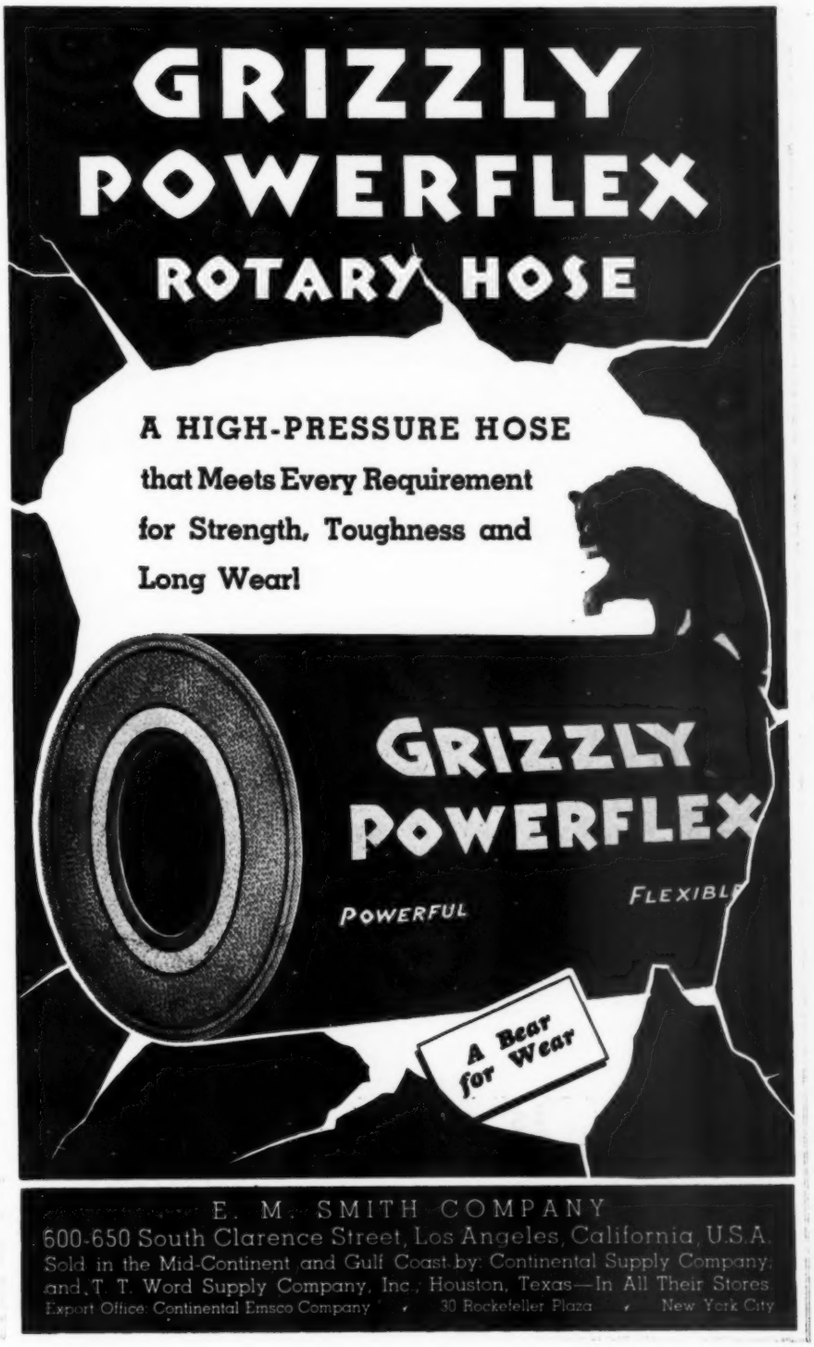
After graduation from Kansas State University in 1924, Dillman joined the Kansas State Highway Department as a civil engineer. Since then he has been engaged in various types of sales work. For the two years prior to joining the meter company, he was with the Continental Oil Company in the sales division.

Dillman will work out of the Tulsa, Oklahoma, office and will be in charge of EMCO-McGaughy Integrator Sales and Service under the supervision of J. L. Cottrell.

H. C. Eddy Returns from Extended Trip

H. C. Eddy, chief engineer of the Petroleum Rectifying Company of California, has just returned from an extended trip through the Gulf Coast, Mid-Continent, and Eastern states where he inspected a number of new Petreco Electromatic Dehydrating Plants installed during recent months, as well as numerous plants that have been completely modernized by the addition of improvements developed by the Petreco engineering and laboratory departments.

Eddy's itinerary included Texas, Arkansas, Kansas, Indiana, Illinois, Missouri, Michigan, New York, and New Jersey, where he spent considerable time conferring with refinery executives relative to problems resulting from salt in crude charging stocks, and inspecting some of the Petreco de-salting plants installed during the past year.


GRIZZLY
POWERFLEX
ROTARY HOSE
A HIGH-PRESSURE HOSE
that Meets Every Requirement
for Strength, Toughness and
Long Wear!
GRIZZLY
POWERFLEX
POWERFUL
FLEXIBLE
A Bear
for Wear
E. M. SMITH COMPANY
600-650 South Clarence Street, Los Angeles, California, U.S.A.
Sold in the Mid-Continent and Gulf Coast by: Continental Supply Company;
and T. T. Word Supply Company, Inc., Houston, Texas—In All Their Stores
Export Office: Continental Emsco Company • 30 Rockefeller Plaza • New York City

H. C. Smith Tool Company Purchases Alco Tool Company

The H. C. Smith Oil Tool Company announces the purchase of the business and manufacturing plant of the Alco Tool Company in Compton, California. This plant covers more than two and one-half acres and consists of two wings, 300 ft. by 80 ft., and 400 ft. by 80 ft., with a two-story general office building in front. Since this deal was consummated, early in May, the plant has undergone a complete renovation, and a number of modern heavy-duty machines have been added to materially increase the facilities for the manufacture of oil tools.

H. C. Smith will be remembered by many oil men as the founder of the H. C. Smith Manufacturing Company in Whittier, California, which developed H. C. Smith coring equipment, drilling bits, and rotary underreamers. His present organization is now introducing to the oil industry a new line of rotary drilling and coring tools.

H. C. SMITH

DETROIT *for* AUTOMOBILES

PITTSBURGH *for* STEEL

AKRON *for* TIRES

TULSA *for* OIL

and

The Oil Bank of America

FOR OIL LOANS

Make your oil loans at a bank that knows how to handle oil business. The National Bank of Tulsa is "The Oil Bank of America" to the Oil Industry. It solicits your oil loans because its officers know there is no better way to invest its depositors' money than in good oil loans.

NATIONAL BANK OF TULSA

Member Federal Deposit Insurance Corporation

British Foundrymen Learn American Practice

Speaking before the Institute of British Foundrymen, held in Glasgow, Scotland, recently, H. H. Judson, foundry superintendent of Goulds Pumps, Inc., presented the American exchange paper entitled "The founding of pressure castings" and dealing with the two cupola process. Writing with the usual British conservatism, the *Foundry Trade Journal* (London) declared Judson's contribution to be "of outstanding value."

Lindsly Reprints Available

The series of articles by Ben E. Lindsly that appeared in *The Petroleum Engineer* under the title of "A Bureau of Mines Study of a 'Bottom Hole' Sample from Crescent Pool, Oklahoma" is now available in reprint form. They may be obtained by writing Mr. John A. Davis, Information Division, U. S. Bureau of Mines, Washington, D. C.

E. R. Lederer Heads Bradford Oil Refining Company

E. R. Lederer, formerly vice-president of the Texas Pacific Coal and Oil Company, Fort Worth, Texas, is now president of the Bradford Oil Refining Company, Bradford, Pennsylvania.

Meriam Company Builds Plant Addition

The Meriam Company, 1955 West 112th Street, Cleveland, Ohio, is now completing a new addition to its plant. The addition is 100 ft. by 54 ft. and is equipped with a "Cleveland" ten-ton capacity traveling crane; and the company has arranged with the New York Central Railroad for a special spur track to run into the building itself. The increased facilities thus provided for handling heavy engines and parts will permit the welding division to expand.

C. H. Osmond to Texas

Charles H. Osmond of New York City, well known in Texas, is preparing to establish his offices at Fort Worth, Texas. Osmond is head of the Sicsi Oil Company, and a director of the Texas Pacific Coal and Oil Company.

Stock Piston Rings

Sealed Power, Inc., is putting in a stock of piston rings at its warehouse at 2717 Main Street, Dallas, Texas. All sizes in standard rings, as well as oversize rings, will be carried for the oil industry and delivery will be available overnight to any part of the Mid-Continent, it is announced.

Hercules Officials Touring Rocky Mountain Area

S. P. Tschappat, general manager of the Hercules Tool Company, of Tulsa, Oklahoma, and L. C. Rhoads, the company's Texas sales representative, are taking a combined vacation and business trip through Colorado, Wyoming, and Montana, via automobile, accompanied by Mrs. Tschappat and Mrs. Rhoads.

The party left Tulsa August 4th. The trip will require two weeks, during which time the Hercules officials plan to visit most of the important oil centers in the Rocky Mountain States and call on many of the leading oil companies of that area.

Here's the New

FLUPACO

"VOLUME PRODUCER"

GROOVE SEAL ROD COLD DRAWN TRAVELING PUMP

A New PRODUCT OF THE

FLUID PACKED PUMP COMPANY

The new Flupaco Groove Seal "Volume Producer" will give you a new conception of pumping economy and efficiency for your deep and large volume wells. It has the largest cross-sectional displacement area possible in an insert type pump. It is designed and constructed to give the maximum life of dependable pumping service with a minimum of down time for inspection or repairs. "Volume Producer" pumps are equipped with grooved plunger sleeves made of specially processed electric furnace melt chrome molybdenum iron, heat treated to produce the most advantageous physical properties.

Cuts YOUR PUMPING COSTS

The precision tubes are cold drawn and specially fabricated for this pump. Simple construction makes the first-cost of a "Volume Producer" pump low; high quality material and careful workmanship assure continuing economy in operation.

Send TODAY for Bulletin No. 11 which describes the Flupaco "Volume Producer" pump and its application to both deep, large volume wells and wells of normal depth and volume.

FLUID PACKED PUMP CO.
BOX 64 • LOS NIETOS, CALIF.

Mid-Continent and Texas Distribution
FLUID PACKED PUMP CO.—Mid-Continent
2 S. E. 29th St., Oklahoma City, Okla.

Send for BULLETIN NO. 11 Today!

FLUID PACKED PUMP CO.
LOS NIETOS (LOS ANGELES COUNTY), CALIFORNIA.

Please send Bulletin No. 11 describing Flupaco "Volume Producer" Groove Seal Type Pumps.

Name..... Position.....

Company..... Address.....

PE 836

Wienecke Joins Gaso Pump as Sales Engineer

The Gaso Pump and Burner Manufacturing Company, Tulsa, Oklahoma, has announced the addition of H. A. Wienecke, of Tulsa, a graduate mechanical engineer, to its Tulsa staff as sales engineer.

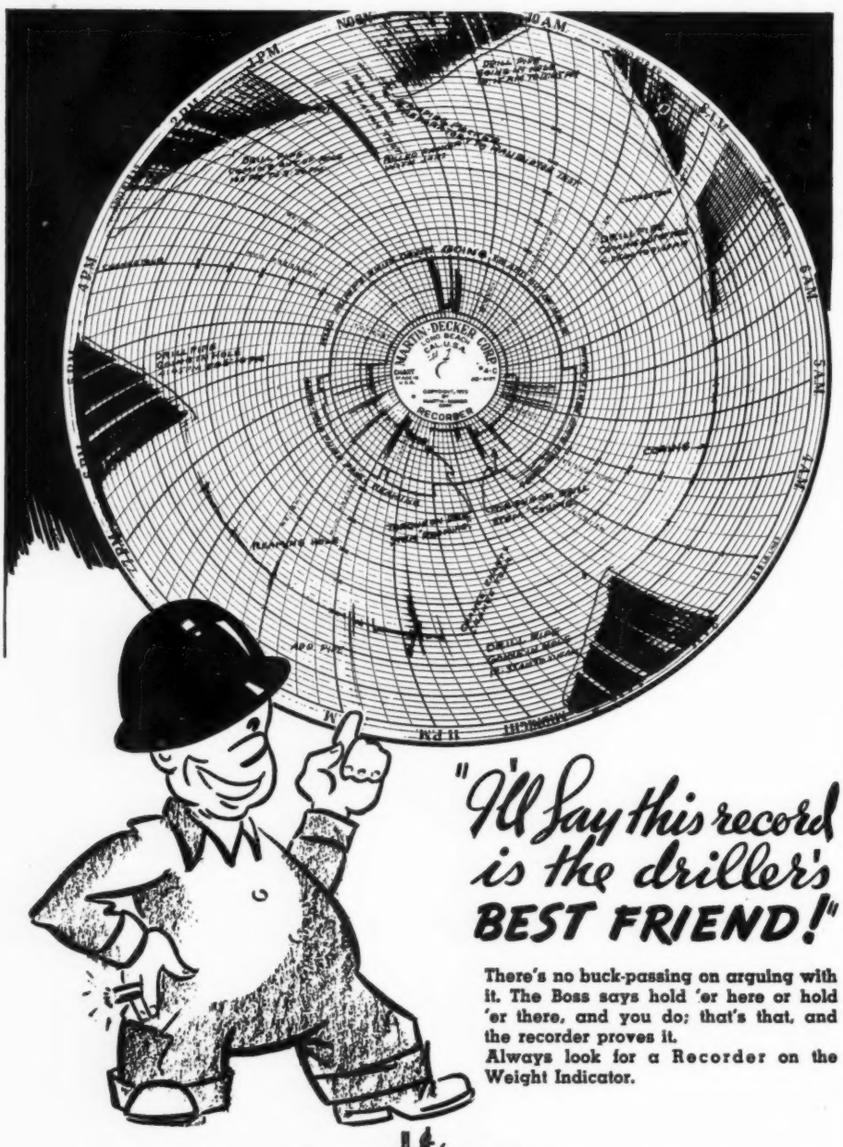
Wienecke was born in St. Louis in 1901, but his family moved to Tulsa in 1914. He attended high school in Tulsa, then became a draftsman for the Prairie Pipe Line Company. In 1921 he obtained leave of absence to attend Washington University at St. Louis, but continued with the Prairie Pipe Line Company in his summer vacations, and in 1925 he received the degree of mechanical engineer from Washing-University.

After graduation he continued with Prairie, first as clerk to R. G. Lewis, master mechanic, then as assistant master mechanic engaged in field work, and from 1932 to 1935 as engineer and buyer in the purchasing department. A year ago he resigned to go with the Continental Supply Company, at Oklahoma City, as a machinery salesman.

Wienecke's special training and wide experience in the oil pipe line business as both engineer and salesman have admirably fitted him for advising oil production, pipe line, and refining companies in connection with their

H. A. WIENECKE

pumping equipment, and for representing the Gaso company, which has specialized for 20 years in building pumps exclusively for the oil industry.


"I'll Say this record is the driller's BEST FRIEND!"
There's no buck-passing on arguing with it. The Boss says hold 'er here or hold 'er there, and you do; that's that, and the recorder proves it.
Always look for a Recorder on the Weight Indicator.
THE WEIGHT INDICATOR
MARTIN DECKER CORP.
LONG BEACH CALIFORNIA
San Joaquin Valley: A. F. McQUISTON, Bakersfield, California
Mid-Continent Distributor: REED ROLLER BIT COMPANY, Houston, Tex.

Sperry-Sun Well Surveying Co. Opens Louisiana Branch

The Sperry-Sun Well Surveying Company opened, on August 1st, a branch office at Lafayette, Louisiana, in the Commercial Bank Building. The new branch will carry in stock H-K and Syfo clinographs and supplies, and also will render Surwel (gyroscopic) service.

The company's main district office in the Gulf Coast territory remains at 3118 Blodgett Avenue, Houston, Texas.

A. J. Swisler Joins Staff Hyatt Roller Bearing Co.

The Hyatt Roller Bearing Company, Harrison, New Jersey, reports that A. J. Swisler has joined its Western sales division in the capacity of sales engineer. Swisler will be assigned to duties in the Texas and Mid-Continent district with headquarters at Dallas, Texas.

He comes to Hyatt with many years experience as a designer of oil field machinery, and should prove a valuable addition to its staff, and of great help to its customers in the Southwest.

As a result of his former association Swisler has a wide acquaintanceship in the district he will cover.

Jensen Bros. Enlarge Plant

Increased business has made it necessary to enlarge their factory at Coffeyville, Kansas, according to William Jensen of Jensen Brothers Manufacturing Company, makers of Jensen pumping units and Jensen rod line jacks.

"Since our business was founded many years ago it has been devoted exclusively to the development and perfection of pumping equipment," Jensen declares. We have a modern plant at Coffeyville, Kansas. It is fireproof, clean, well ventilated and adequately lighted. Recent increased demand for Jensen pumping equipment has made it necessary to enlarge this factory. We have added casting, storage, and chipping or cleaning room space, totaling more than 3000 square feet.

E. P. Aitchison to Youngstown, Ohio, for Hydril

E. P. Aitchison, for several years stationed at the Torrance factory of

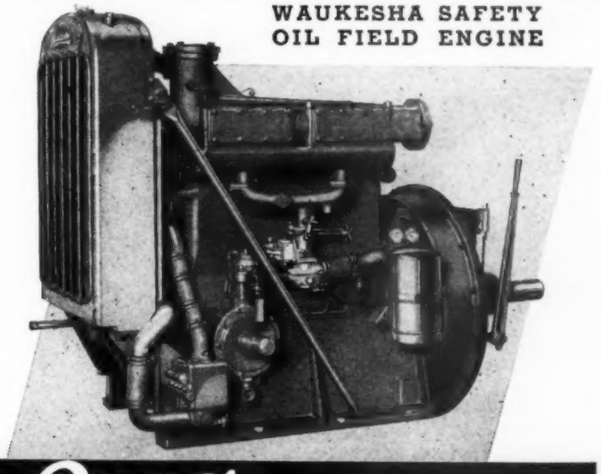
E. P. AITCHISON

the Hydril Company, has been transferred to Youngstown, Ohio, where he will be in charge of the new branch factory of the company recently opened.

Named Distributor Republic Tubular Products

Taylor-Parker Company, Inc., Water Street and Commercial Place, Norfolk, Virginia, has been named distributor of Republic tubular products, according to an announcement made by N. J. Clarke, vice-president in charge of sales, Republic Steel Corporation, Cleveland, Ohio.

WAUKESHA SAFETY OIL FIELD ENGINE



Safe Power

TROUBLE-FREE OPERATION . .

LOWER UP-KEEP . . . . . .

In designing this engine for every oil field service, Waukesha engineers met the operator's double demand for—a high degree of safety from accidental ignition of inflammable vapors or escaping gas . . . and trouble-free, low up-keep performance.

***Water Cooled Manifold*—The exhaust manifold, entirely surrounded by water, forms the sole outlet from engine to radiator. All water, after cooling engine, passes through manifold jacket.**

***Gas-Tight Ignition System*—A gas-tight, water-proof magneto is used, together with super-insulated, water-proof cables, which are connected by screw couplings to the cover plate enclosing the spark plug chamber. A screened opening in the plug chamber provides ventilation for spark plugs and terminals.**

***Automatic Stop*—in case of oil or water shortage—is another important safety feature.**

***Wide Operating Speed Range*—Full loads at 1050 rpm maximum for continuous stationary duty; no load, 1200 rpm maximum for intermittent duty.**

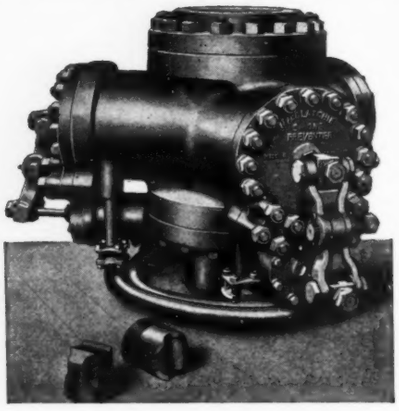
***Triple Size Clutch*—The liberal size and easy adjustment of the clutch contributes materially to low maintenance cost.**

***Oversize Flywheel*—The large 30 in. diam. flywheel, like the clutch, is standard equipment.**

The Waukesha Safety Oil Field Engine is built in one size only . . . 4 cylinders, 45 hp. to 60 hp. Write for Bulletin 898. *Waukesha Motor Company, Waukesha, Wisconsin*

WAUKESHA ENGINES

A NEW BLOWOUT PREVENTER



Operatable From Derrick Floor

•

Withstands Any Pressure Encountered

•

Fast Closing

•

Packs Off Any Part of Drill Stem Without Changing Packers

•

Eliminates Extra Equipment

Here it is at last—the kind of preventer operators have been looking for since the beginning of rotary drilling. The MacClatchie "5 in 1" Blowout Preventer packs off any portion of the drill string that happens to be suspended in it regardless of size or shape. It accomplishes this with phenomenal speed—approximately 55 seconds. As no sand or dirt can enter to impair its proper functioning it always packs off with a positive certainty. This preventer is built to withstand the pressures of present day drilling being tested to hold 4000 lbs. cold water pressure.

It packs off the drill pipe and square kelly with same set of packers. Without any change in the packing the MacClatchie "5 in 1" Blowout Preventer will pack off any part of the string such as Drill Pipe, Kelly, Drill Collars, Tool Joint or Pipe Collar—providing 5 preventers in 1 and thereby greatly reducing the investment in equipment and cellar space.

It is constructed with three cylinders with a heavy rubber packer operated by hydraulic pressure in each cylinder. These packers are made of 5000-lb. tensile strength rubber and are 3 inches thick—thereby giving a large safety factor in handling the highest pressures. The rubbers are confined in steel plates to restrict their expansion to the desired area.

Packs any part of the string with greater speed and certainty than ever before obtained.

It is by far your best insurance against blowouts.

Operates instantly for the derrick floor, thereby eliminating the hazard of men entering an oil and gas drenched cellar.

MacCLATCHIE MANUFACTURING CO.

Compton, California **Houston, Texas**

Export: GEO. R. WOODS, 17 Battery Place, N. Y. C.

W. S. Morris New Chairman East Texas Engineering Association

W. S. "Buck" Morris has been named to succeed Carl E. Reistle, Jr., as chairman of the East Texas Engineering Association. The latter has been appointed assistant chief petroleum engineer of the Humble Oil and Refining Company.

W. S. MORRIS

Morris has been in the engineering department of the Indian Territory Illuminating Oil Company at Oklahoma City, Oklahoma. He has been connected with the oil industry since 1924, at which time he became associated with the Empire Gas and Fuel Company. In 1926 he left to join the staff of the U. S. Bureau of Mines, being stationed first in the Davenport field of Oklahoma, later being transferred to the Seminole area, and in 1929 did considerable work in the Rocky Mountain territory.

In December, 1929, he joined the engineering staff of the I. T. I. O. Company and after spending two years at Bartlesville, Oklahoma, was transferred to Oklahoma City.

U. S. Steel Corp. Exhibits at Michigan Show

Representing seven principal subsidiary companies, an informative exhibit of genuine interest and significance to oil men is being presented by United States Steel Corporation at the Michigan Oil and Gas Exposition, Mt. Pleasant, Michigan, August 11-16, 1936.

Principal display space is devoted to an exposition of American Steel and Wire Company's products as applied to oil field use, including wire rope and cable exhibits, electrical wires, and other wire product displays.

Also on exhibit are alloy steels as applied to drilling equipment and galvanized steel for economical roofing and siding of oil field structures, both products of Carnegie-Illinois Steel Corporation.

United States Steel's display spaces are Nos. 24 and 25, Science Hall, on the exposition grounds.

TRADE LITERATURE

JON R. LONG, manufacturer, successor to Oil Field Engineering Corporation and Petroleum Equipment Company, Fort Worth, Texas, has issued catalog No. 6, giving details on pumping and gas-lift production equipment.

A HANDSOMELY PRINTED and illustrated brochure has been published by the Hercules Motors Corporation, Canton, Ohio, covering their complete line of Hercules Diesel engines, which includes solid injection and compression ignition type units.

BYRON JACKSON COMPANY, Los Angeles, California, has issued a bulletin on its Bilton pumps. Drawings, charts, tables, and photographs are generously used throughout the booklet to make clear the operating features of the pump. The bulletin is No. 360-B and copies are being sent free upon request.

A FOLDER illustrating and describing the features of Brown operated air controllers, recently introduced by the Brown Instrument Company, Philadelphia, is being sent free upon request to interested parties.

TWO LEAFLETS have been issued by the General Electric Company, Schenectady, New York. One describes in detail manual motor starting switches CR1062, and is numbered 1522-C. The other is an illustrated folder giving information concerning G-E Pyranol capacitators.

THE CAVINS COMPANY, with headquarters at Long Beach, California, now has ready for distribution a new, comprehensive four-page bulletin describing in detail the operation and mechanical features of the Cavins perforation washer. Detailed charts and drawings illustrate its assembly and uses, and show how it works.

Oil operators who have well-cleaning problems will find this bulletin both interesting and instructive. Copies will gladly be supplied by the manufacturer upon request.

A RECENTLY ISSUED, 16-page catalog, No. 1101B, details the features of the Tag indicating, recording, and controlling pyrometers that utilize a beam of light, a mirror galvanometer, and a photo-tube. This construction offers instantaneous action, accuracy of 0.1 percent and high sensitivity, the manufacturers state. Large interior illustrations of the various models are clearly marked and thus provide a quick understanding of the operation.

Copies of this catalog will be sent free by addressing your request to C. J. Tagliabue Manufacturing Company, Park and Nostrand Avenues, Brooklyn, New York.

STEVENS RING-TYPE GASKETS

GASKETS

MANUFACTURERS
of ALL TYPES

Immediate Delivery on Special Gaskets

STEVENS ASBESTOS PRODUCTS CO.
216 East Seventh Street - - - Tulsa, Oklahoma

RUGGED • FAST • FLEXIBLE

• Young Engines are built to last. Put them on your toughest drilling job. Their speed, flexibility and economy make them first choice with every driller who uses them. Built as a complete unit, they can be moved easily by truck and set up in an hour's time. Control is simple—one lever gives forward, reverse and sets the automatic brake. Write for New Bulletin 20-P. Young Engine Corporation, Canton, Ohio, or see A. E. Avers, 230 E. 14th Street, Tulsa, Oklahoma.

YOUNG DRILLING ENGINES
GAS . . . GASOLINE . . . DIESEL

•

TEN DAYS SAVED

On this Clean-out Job!

The clean-out job on the well shown above is another example of the speed and efficiency of the Cavins Bailer. After this particular well (with 8⅝" O. D. Casing) was perforated and the fluid level bailed down, the sand heaved in 400 feet. The well owner spent two days in cleaning out 50 feet and then called for a Cavins Automatic Hydraulic Suction Bailer. The Cavins, loading and dumping automatically, cleaned out the remaining 350 feet in the record time of four days—representing a saving in time alone of 10 days.

For a faster and more efficient clean-out job, call for the Cavins . . . it will save time, money and effort. Write for descriptive Bulletin No. 36.

THE CAVINS COMPANY

2853 Cherry Ave. (Phone 414-14) Long Beach, California

Cable Address: "Cavins, Long Beach" *Foreign Representative:* R. J. EICHE

Bakersfield, California; Taft, California; Ventura, California; Odessa, Texas; Houston, Texas; Kilgore, Texas; Pampa, Texas; Oklahoma City, Oklahoma; Wichita, Kansas; Lyons, Kansas; Lake Charles, Louisiana.

For Remote, Unguarded Places— a light, sturdy, self-protecting REGULATOR

Spring-Type Regulator

A spring-loaded regulator may be preferable to one of the lever type if it is to be placed where it can not be closely guarded and perhaps in a spot difficult to reach. It has the advantages of light weight and compactness for easy transportation, simplicity for easy installation, sturdy self-protection against meddlers or any effect of the elements. The Fulton Spring-Type Regulator is thoroughly dependable for such uses. Equipped for high pressure, it reduces from 300 pounds to any desired pressure between 10 and 50 pounds. For low pressure, reduces from a maximum of 50 pounds to any outlet pressure not exceeding one pound. Write for catalog of Chaplin-Fulton Regulators, known as the best for fifty years.

THE CHAPLIN-FULTON MFG. CO.
28-40 Penn Ave. Pittsburgh, Pa.

Simplifies **THE BIG JOBS**

Put a Buckeye Ditcher on any job, and you can be sure that the ditch will be completed at lowest cost and right on schedule.

For the BIG jobs, you will need the Buckeye Model 48 that digs trench from 22 inches to 40 inches in width and up to 8½ feet deep. May we send you complete operating data?

Use **Model 48 by Buckeye**
FOR THE BIG JOBS —

BID THE Buckeye WAY
ask for our operation data before you bid

THE BUCKEYE TRACTION DITCHER CO., FINDLAY, O.

Colox Adds to Engineering Staff

THOMAS HOLMES, JR.

Colox Sales and Service, Houston, Texas, a division of Geo. S. Mepham Corporation, announces the appointment of Thomas Holmes, Jr., to the Colox engineering staff in the Gulf Coast territory. Holmes has a master's degree in mining engineering from Colorado School of Mines, and is a graduate of West Point in engineering. He comes to the Colox organization from Halliburton Oil Well Cementing Company.

PATRICK BARRY, JR.

Colox also recently appointed Pat Barry, Jr., to the staff of Colox field engineers, following his resignation from Jefferson Lake Oil Company, where he was assistant field superintendent. Barry will make headquarters in Lafayette, Louisiana, and will cover the southeastern portion of that state. He received his engineering training at Louisiana State University, and for two years prior to joining Jefferson Lake Oil Company was with the federal government, doing river survey work in southeastern Louisiana.

BOB BIERING

Another addition to the Colox engineering staff is Bob Biering, who will be stationed in the Gulf Coast territory. He is a graduate of Rice Institute in chemical engineering, and is widely known as one of the South's leading football stars. His field experience includes service with Mission Manufacturing Company, the Humble Oil and Refining Company, and the Gulf Oil Corporation.

Reid Hodgson, member of Colox engineering staff in Louisiana fields, has been transferred to Ada, Oklahoma, where he will cover the active territory in the Oklahoma City-Ada territory. He formerly was at Lafayette, Louisiana. Hodgson joined Colox Sales and Service following completion of a course in chemical engineering at Rice Institute, Houston.

Carson New Distributor for Sievers Reamers

Security Engineering Company, manufacturers of the Sievers Reamer, announces the appointment of Carson Machine and and Supply Company, Oklahoma City, Oklahoma, as exclusive distributors for Oklahoma and Kansas.

Adequate stocks of Sievers Reamers in all popular sizes are now available through all field stores of Carson Machine and Supply Company in active Oklahoma and Kansas fields.

Gulf Coast and other Texas distribution of the Sievers Reamer will continue to be handled by Wilson Supply Company, who have contributed largely to its introduction in those areas. Foreign inquiries should be directed to Security Engineering Company, 420 Lexington Avenue, New York City.

J. H. Sickler Now With A. O. Smith Corporation

J. H. Sickler has joined the sales force of the A. O. Smith Corporation, of Milwaukee, Wisconsin. He will be in the Los Angeles office in the oil and gas field products division of that company, specializing on casing sales.

J. H. SICKLER

"Hack" Sickler, as he is known in the oil fields, is a native Californian and a member of the class of '26 of Stanford University. He has previously been associated with the Belridge Oil Company as assistant purchasing agent and for the past six years has been purchasing agent of the Western Pipe and Steel Company of Southern California.

Promotions in Lucey Organization

John A. Chapman, who has been sales manager for five years, has been promoted to the position of assistant general manager of Lucey Products Corporation. R. S. Levering, who has been a vice-president for ten years, and who has been in charge of the Oklahoma territory, has been made vice-president and sales manager. Both men will make their headquarters at Tulsa.

JOHN A. CHAPMAN

R. S. LEVERING

A new service point has been added by a store at Rodessa, Louisiana, for customers of Lucey rotary drilling equipment, and a location for a new store at Hays, Kansas, is being made.

Eastman Oil Well Survey Company Moves General Offices to Dallas

General offices of the Eastman Oil Well Survey Company have been moved from Long Beach, California, to Dallas, Texas, and the company recently has been re-incorporated. Under the new setup H. John Eastman is the president; James D. Hughes and Ray Bolton, vice-presidents, and Guy E. Brown, secretary-treasurer. All will make their headquarters in Dallas. Eastman previously has been in California, Hughes and Brown in Houston, Texas, and Bolton in Oklahoma City, Oklahoma.

Ernest Potts has been made manager of the southern division of the company and will make his headquarters at Houston. Phil Collins will be in charge of the California and western division.

Temporary offices have been established in Dallas at 2507 Commerce Street, pending construction of permanent buildings just outside of Dallas on the Fort Worth highway.

DIESELS
losing power?

DON'T let rust, scale and dirt clog up the water jackets of your Diesels. If you do, engine cooling will suffer, you'll lose power, lubricating costs will rise.

The thing to do, particularly in this hot weather, is to clean cooling systems thoroughly, keeping them at top efficiency with inexpensive, speedy Oakite cleaning.

You'll be surprised at the greater power you'll get. Ask for details. Write today.

Manufactured only by
OAKITE PRODUCTS, INC., 48 Thames St., NEW YORK, N. Y.
Branch Offices and Representatives in All Principal Cities of the U.S.

OAKITE
TRADE MARK REG U.S. PAT. OFF.
SPECIALIZED INDUSTRIAL CLEANING MATERIALS & METHODS

DIESEL ENGINES

5 and 10 Horsepower
Horizontal
Four Cycle
Enclosed, Self-Oiling
Roller Bearing

LIGHT ON LOWER POWER COSTS

WITTE Diesel Engines are simple in design and construction, cut operating costs and increase profits. It brings to the small power user the same economy and dependability as the large diesel. Fuel consumption of less than one-half pint per horsepower per hour. With a WITTE you can be sure of the ability to handle full loads with efficiency and operate long hours without interruption. Choose a WITTE for smooth-running low-cost power. Quality is assured by more than 65 years of manufacturing experience.

3 to 7½ K.W. AC-DC

DIESEL LIGHT PLANTS

Produce electricity for less than One Cent per Kilowatt. Generators engineered to the engine they serve. Alternating or Direct current. Close voltage regulation.

Distributors Wanted . . Write Today . . No Obligation

WITTE ENGINE WORKS
197C Oakland Avenue Kansas City, Mo.

NOW ready to serve you at the following United Supply Stores:

OKLAHOMA CITY

HUTCHINSON, KANSAS

STONEWALL, OKLAHOMA

EUNICE, NEW MEXICO

COMPLETE STOCKS — TRAINED STAFFS
INTELLIGENT SERVICE — PROMPT DELIVERY

United takes pleasure in announcing the assembly of complete and diversified stocks at the above points, incident to the completion and operation of oil and gas properties. Prompt, efficient and courteous service. May we not anticipate your favorable consideration?

UNITED SUPPLY & MFG. COMPANY
TULSA, OKLAHOMA
H. B. Gutelius **C. J. Halloran** **F. P. Thieman**

Annual Engineering Review
September Issue

MAIL YOUR SUBSCRIPTION NOW!
1 Year, $2.00 2 Years, $3.00

THE *Petroleum* **Engineer**
P. O. Box 1589 Dallas, Texas

USE THIS COUPON

THE PETROLEUM ENGINEER,
P. O. Box 1589, Dallas, Texas.

Date_____

Enclosed is $_____ for a _____ year (new) (renewal) subscription.

*Name*_____

*Title or Occupation*_____

*Company*_____

*Street or P. O. Box*_____

*City*_____ *State*_____

Trade Personals

FRANK C. MILLER, formerly associated with the Detroit sales office, has been appointed manager of sales, Tin Plate Division of Republic Steel Corporation, according to an announcement by **N. J. CLARKE,** vice-president in charge of sales. Miller succeeds **GEORGE E. TOTTEN** recently resigned. **P. H. HUBBARD** has been named assistant manager, as has **J. B. DeWOLF,** formerly district sales manager of the Philadelphia territory. Further alignments in the division include the appointment, as field man, of **W. H. UNGASHICK,** who was formerly associated with Canton Tin Plate Company, which was recently acquired by Republic. **J. T. McBRIDE** has been named chief clerk of the division.

RUDOLPH FURRER

RUDOLPH FURRER has been appointed industrial engineer of the manufacturing department of Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin. Furrer became connected with the National Tube Company, subsidiary of the U. S. Steel Corporation, in 1932, where, for three years prior to his recent appointment with Allis-Chalmers, he acted as assistant to the vice-presidents.

J. M. McKIBBIN has been appointed manager of a newly-created sales promotion department, according to an announcement by **N. G. SYMONDS,** vice-president in charge of sales, of the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pennsylvania.

All apparatus sales promotion operations except those of the company's merchandising department will be coördinated under the new department's management and the activities of district office sales promotion managers will be directed by Mr. McKibbin. There will be no change in the advertising department now under the management of **R. R. DAVIS.** Mr. McKibbin has been associated with Westinghouse since 1920 and has been sales promotion manager of the Cleveland, Detroit, and Pittsburgh sales offices.

JAMES W. GILLESPIE has been appointed salesman for the Southwest territory by the Flexible Steel Lacing Company, Chicago, Illinois, succeeding to the post made vacant by the death of **W. ERNEST OLDFIELD** in May. Gillespie will cover Texas, Louisiana, Arkansas, and Oklahoma, and will make his headquarters in Dallas, Texas.

THOMAS CRUTHERS has been appointed vice-president of the Worthington Pump and Machinery Corporation. Cruthers' connection with Worthington dates from 1907. Graduated from Stevens Institute of Technology, where he received the degree of Mechanical Engineer, he first entered the employ of the Westinghouse Machine Corporation, during which connection he served as superintendent of gas engine erecting. In 1907, in the same capacity, he entered the service of the Snow Steam Pump Works, a Worthington subsidiary at Buffalo, New York. Transferred to the Worthington sales department in 1908, his first assignment was to the Pittsburgh district office territory, and subsequently to various others of the corporation's district offices until 1927, when he was appointed New York district sales manager.

In 1930 he was appointed assistant general sales manager, and two years later was appointed assistant vice-president in charge of sales.

Le Roi Company Opens Branch at Tulsa

The Le Roi Company, Milwaukee, Wisconsin, manufacturers of heavy-duty, internal combustion engines, has opened a factory branch and warehouse at 28 North Guthrie Street, Tulsa, Oklahoma, to provide complete sales and service facilities to the oil industry. L. G. Valdes, branch manager for six years, is in charge of the new office.

Le Roi Company manufactures a complete range of engines from three hp. to 400 hp., for operation on gasoline, natural gas, or butane; engine-generator sets from 1½ kw. to 200 kw., a-c. or d-c.; portable air compressors, single and two stage, from 12 cu. ft. to 420 cu. ft. capacity; and stationary air compressors, single and two stage, from 30 cu. ft. to 540 cu. ft. capacity.

Bulletin DE1, describing Le Roi Drilling Engines, of the type exhibited at the Petroleum Exposition, is now available.

H. J. Hawley New General Manager California Company

Henry J. Hawley has been appointed general manager of the California Company's Texas division, succeeding Richard H. Morrison, who recently was made vice-president of the newly-formed California-Texas Oil Company, Ltd.

Hawley has been with the California Company for 17 years. He graduated from Stanford University in 1916, and prior to the World War did geological work in many of the Wyoming, Montana, and Colorado fields. In January, 1919, he became connected with the Standard Oil Company of California and for the next several years was in charge of geological exploration work in South America, his duties taking him into virtually every oil field of that country. Returning to the States in March, 1924, he was sent to the Rocky Mountain area where he remained until 1926. From 1926 to 1932 he was stationed at the company's general headquarters at San Francisco, California. From 1932 to 1933 he was in Europe, and in the spring of 1934 was transferred to Dallas, Texas, as assistant general manager of the California Company's Texas division, which position he held at the time of his recent promotion.

A. J. Cunningham has been appointed assistant general manager of the company. He has been with the California Company since 1923 as attorney and land man. He has been head of the land department since 1929, and has been stationed in Texas since 1927.

HITTING THE MARK

Many shoot, but few are shots. It is one thing to pump ten slugs in the outer ring—another to group them within a 2" radius of the bulls-eye. Each year many pumps are made and sold that hit the bulls-eye of superlative performance. Other pumps are made and sold—still others are just made. Check up on all pumps and you won't need to guess what pump is hitting the bulls-eye of users satisfaction. You will find it is Pomona. Correctly engineered, constructed of the best materials, machined by skilled artisans, sold and serviced by men rich in a background of pumping experience. That's Pomona.

Send today for a brand new bulletin featuring things you should know about hydraulic laboratory tests.

POMONA PUMP CO.

53 W. Jackson Blvd., Chicago • 206 E. Commercial St., Pomona, Cal.

POMONA TURBINE PUMPS

BRADFORD MOTOR WORKS INC.

OIL WELL SUPPLIES

BRADFORD, PA. — TULSA, OKLA.

EXPORT OFFICE, 30 CHURCH ST., NEW YORK CITY

Admore Insert Pump Anchor

Enables you to pump from any level in the tubing. Packs off. Holds down.

Seats the Admore Liner Barrel and other Insert Pumps at any desired point in the tubing. The cost is small when compared with what it saves. A thorough test will please you.

Obtainable at supply stores. . . . The coupon below, for your convenience, lists the principal B-M-W Products.

BRADFORD MOTOR WORKS, INC., Bradford, Pa.

Please send complete information on the following B-M-W Products without obligating us in any way:

- ☐ ADMORE Insert Pump Anchors.
- ☐ BALLS and SEATS, (Made for every pumping service.)
- ☐ ADMORE Liner Barrels.
- ☐ TEX TYPE Plunger Fittings and Valves.
- ☐ COLLINS Belt Clamps.
- ☐ NEILSON Tools, (Safety Sucker Rod Hooks; Tubing Hooks, Sucker Rod Elevators; Sucker Rod Sockets, etc.)
- ☐ Please send representative.

Name .....

Firm .....

Street .....

City ..... State .....

Bring Your Knowledge of
PUMPING EQUIPMENT
Down to 1936!

Don't be an ostrich! If better pumping equipment is made than you now use, it's your job to know about it.

We don't expect you to take our word for it that JENSEN Straight-Lift PUMPING UNITS and Rod-Line JACKS are more efficient and economical than the equipment you have been using. But we DO expect you to take our word for it that you ought to investigate. Spend 3c to bring your knowledge of pumping equipment down to 1936! Address:

JENSEN JACKS

JENSEN BROTHERS MANUFACTURING COMPANY
Coffeyville, Kansas, U. S. A.

Business Men Prefer
The TEXAS STATE
in Houston

1. Because it is the most accessible and centrally located hotel in Houston.
2. Because it is Houston's newest, most modern, most comfortable hotel. (400 ROOMS—SHOWERS, TUBS)
3. Because its AIR-COOLED GRILL and DINING ROOM serve the BEST FOOD at the LOWEST PRICES.

The
TEXAS STATE HOTEL
400 ROOMS 400 BATHS
HOUSTON, TEXAS

Book Reviews

Correction Tables for Petroleum Oils. By O. H. Bardill. Published by Petroleum Accounting Service, 3812 15th Avenue South, Minneapolis, Minnesota. Price $4.50.

The tables contained in this volume show at a glance 10 to 30,000 gallons corrected to a temperature of 60 deg. fahr. at temperatures ranging from 45 deg. fahr. below zero to 154 deg. fahr. above zero. The tables were compiled to meet a necessity in the oil industry for quickly and accurately obtaining temperature corrected gallons without looking up the proper coefficient of expansion decimal and laboriously multiplying, pointing off decimals, adding, or subtracting to arrive at the ultimate gallons. With these tables addition only is necessary.

* * *

The Handbook of Chemistry and Physics. (Nineteenth edition). Editor-in-Chief, Charles D. Hodgman, M.S. Published by Chemical Rubber Publishing Company, Cleveland, Ohio. 1934 pp. Price $6.00.

The nineteenth edition of this handbook represents a 21-year accumulation of data for the busy scientist and engineer. In the edition will be found 274 pages of mathematical tables and formulae, 956 pages of chemical tables, including physical constants of 4000 organic compounds and physical constants of 4000 inorganic metal-organic compounds, 44 pages on properties of matter, 146 pages on heat, 114 pages on sound, electricity and magnetism, 70 pages on light, 283 pages of measures and units, and many other pages of useful tables and information of interest to all workers in the sciences.

The most extensive of the new tables added to the latest edition is the one on X-Ray Crystallographic Data. The determination of crystal structure by X-Ray analysis has been carried on extensively in recent years, for which reason this table should be of great value to chemists and physicists.

* * *

Practical Everyday Chemistry, by H. Bennett. Published by the Chemical Publishing Company, 1450 Broadway, New York City. 300 pp. Price $2.00.

This book is written not so much for the professional chemist as for the layman who may wish to "dabble and putter" with chemicals. Contained in its pages are hundreds of formulas disclosing the compositions and methods of making many objects with which a person comes in contact daily. From it one can learn how to transform a few simple ingredients into cosmetics, beverages, adhesives, drugs, inks, soaps, lubricants, tooth powder, polishes, waxes, etc. The information here available may be used in furtherance of a hobby, or for the laying of a foundation for more serious chemical pursuits. Many publications, laboratories, manufacturing companies, and trained individuals have contributed to the volume's compilation.

* * *

The Chemical Formulary (Vol. 2). Edited by H. Bennett. Published by D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York City. 570 pp. Price $6.00.

Volume 2 of *The Chemical Formulary* differs from Volume 1 in that it treats the newer developments, while Volume 1 covers the standard formulas used in every industry and for every purpose. Thousands of entirely new, thoroughly up-to-date chemical formulas, stated in the easiest way for tion of 109 chemical experts.

E. S. Walne Becomes Manager Bettis Sales Company

E. S. Walne, after spending 16 years in Mexico, has resigned his position as assistant to the general fields superintendent of the Mexican Eagle Oil Company at Tampico to become manager of Bettis Sales Company, Houston, Texas, in which he has acquired a substantial financial interest. From 1920 to 1927 he was local purchasing agent for the Mexican Eagle. Prior to going to Mexico he was connected with Humble Oil and Refining Company at West Columbia, Texas, where he worked in the drilling and production departments. At the time of his move to Mexico he was chief clerk and head warehouseman in the West Columbia district.

E. S. WALNE

Allen P. Berry, whose experience in the oil industry has taken him to many parts of the world, has joined the sales force of Bettis Sales Company under Walne's management. In this capacity he will continue to represent the Sheldon Machinery Corporation in the Mid-Continent, where he came in 1928 to handle sales for that organization. Berry's experience dates back to 1908, when he went with Oklahoma Natural Gas Company in Tulsa. In 1912 he went with the Shell Oil Company to Mexico, and a year later joined the J. F. Lucey Company for several years of service in Mexico, and later service in the Dutch East Indies for two years. He returned to Mexico in 1923 as manager of Lucey Manufacturing Corporation of Mexico, and in 1926 went to New York City in export for Lucey Products Corporation.

ALLEN P. BERRY

George B. Morris Back From Europe

George B. Morris, president, Bradford Motor Works, Inc., Bradford, Pennsylvania, arrived in New York aboard the SS "Bremen" on July 31st, having completed a business and pleasure trip to England, Germany, Poland, Austria, and other European countries.

J. K. Carter, formerly connected with the Trojan Cup Company, has joined the sales force of the Bradford Motor Works. He will represent the latter company in the Gulf Coast territory, with headquarters in Houston, Texas.

Columbus to Get A.P.I. Eastern Meeting

The 1937 meeting of the Eastern district of the American Petroleum Institute's Division of Production will be held June 3 and 4 in the Deshler-Wallick Hotel at Columbus, Ohio, it has been announced by Chairman J. C. Askam, of the Ohio Oil Company, Findlay, Ohio. The 1936 meeting, at which Chairman Askam and other officers were elected, was held at Pittsburgh, Pennsylvania.

Made Enduro Steel Distributor

The name of Chas. Millar & Son Co., Utica, New York, has been added to the list of Enduro stainless steel distributors appointed by N. J. Clarke, vice-president in charge of sales, Republic Steel Corporation, it has been announced at the corporation's Cleveland headquarters.

Gotkool
WATER CANS & COOLERS

GOTT Water Coolers are the convenient way to keep drinking water handy to the worker, protect it from impurities. Their exclusive construction keeps water cool for long periods. Snug fitting large removable top, handy non leaking push button faucet. GOTT Water Cans for handy field use. Your Supply Store has them, get one today!

GOTT WATER COOLER
Made in 3, 5, 8, 10, and 20 gallon sizes.

GOTT WATER CAN
Made in 1½, 3, 5, and 10 gallon sizes.

H. P. GOTT MFG. CO.
WINFIELD, KANSAS

KEEP PURE DRINKING WATER ALWAYS HANDY

Look for the Leaden *Seal on Each Each*

ARMSTRONG BROS.
CHAIN TONGS

Five Important Features

1. Chain of proven strength . . . each proof tested to tow-thirds catalog strength (3,600 to 40,000 pounds). 2. Jaws drop forged from special steel, heat treated, hardened, tempered and tested for wearing qualities. 3. Drop forged, alloy steel shackle. 4. Large hardened steel bolt. 5. Handles forged from special steel that gives both stiffnes and "spring." Jaws have forged-in-lugs that serve as guides and prevent chains from jamming.

Write for Catalog B-35

ARMSTRONG BROS. TOOL CO
"The Tool Holder People"
331 N. Francisco Ave. CHICAGO, U.S.A.

● HYDRAUGER ●
MODERN HORIZONTAL BORING MACHINE
For Underground Installation of Pipe and Conduits. Avoids damage to costly pavements and saves time. Send for Bulletin.
HYDRAUGER CORPORATION, Ltd.
116 New Montgomery St. • San Francisco, Calif.

SPERRY-SUN WELL SURVEYING CO.
1608 WALNUT STREET, PHILADELPHIA, PA.
HOUSTON, TEXAS. TULSA, OKLAHOMA
AND LONG BEACH, CALIFORNIA

SURWEL (Gyroscopic) H-K (Open Hole) SYFO (Ink Bottle)

UNDERGROUND WELL SURVEYING SERVICE

More Successful Operation is Assured by the use of AXELSON Pumps and Sucker Rods

AXELSON MANUFACTURING CO.

P. O. Box 710 Vernon Station, Los Angeles

St. Louis 50 Church Street, New York Tulsa

Mid-Continent and Eastern Distributor: **Frick-Reid Supply Corp.**

Rocky Mountain Distributor: **Great Northern Tool & Supply Co.**

INDEX *to* ADVERTISERS

American Cable Co.	Inside Back Cover
American Meter Co.	12
Anderson, Alexander, Inc.	
Armstrong Bros. Tool Co.	119
Axelson Manufacturing Co., Ltd.	54 and 120
Baash-Ross Tool Co.	11
Baker Oil Tools, Inc.	93
Baroid Sales Co.	89
Bartlett-Hayward Co.	59
Bradford Motor Works	117
Bridgeport Machine Company, The	103
Broderick & Bascom Rope Co.	
Brown Instrument Co.	
Buckeye Traction Ditcher Co.	114
Bryon Jackson Co.	85
Cameron Iron Works, Inc.	61
Carnegie-Illinois Steel Corp.	99
Cavins Co., The	113
Chaplin-Fulton Mfg. Co., The	114
Chapman Valve Manufacturing Co., The	2
Chemical Process Corp.	23
Chiksan Oil Tool Co., Ltd.	104
Clark Bros. Co.	
Continental National Bank, Fort Worth	8
Continental Supply Co., The	63
Cook, C. Lee Mfg. Co.	106
Cooper-Bessemer Corporation, The	47
Eagle-Picher Lead Co., The	3
Edwards, E. H. Company	17
Elliott Core Drilling Co.	75
Emsco Derrick & Equipment Co.	
First National Bank, Fort Worth	8
Fluid Packed Pump Co.	109
Fluor Corporation, Ltd.	
Fort Worth National Bank	8
Frick Reid Supply Corp.	
Gaso Pump & Burner Manufacturing Co.	71
General Electric Co.	
Globe Oil Tools Company	
Gott, H. P., Manufacturing Co.	119
Green Head Bit and Supply Co.	
Guiberson Corporation	9
Halliburton Oil Well Cementing Co.	Back Cover
Hazard Wire Rope Co.	
Hercules Tool Company	
Hinderliter Tool Co.	56-57
Hyatt Roller Bearing Co.	4
Hydrauger Corporation, Ltd.	119
Hydril Company	83
International Derrick & Equipment Co.	
International Harvester Company of America	45
Jensen Bros. Mfg. Co.	118
Johnston, M. O., Oil Field Service Corp.	79
Jones & Laughlin Steel Corporation	
Kobe, Inc.	7
Lane-Wells Co.	94
Leschen, A. & Sons Rope Co.	14
Linde Air Products Co., The	19
Lucey Products Corp.	67
Lufkin Foundry & Machine Co.	43
MacClatchie Mfg. Co.	112
Martin-Decker Corporation	110
Mepham, Geo. S. & Co.	53
Merco-Nordstrom Valve Co.	Front Cover
Metric Metal Works	12
Mission Mfg. Co.	24
Moore, Lee C. & Co.	41
National Bank of Tulsa	108
National Supply Companies, The	48
National Tube Co.	100-101
Oakite Products, Inc	115
Oil Center Tool Co.	
Oil Well Supply Co.	10
Otis Pressure Control, Inc.	105
Oxweld Acetylene Co.	19
Parkersburg Rig & Reel Co.	91
Patterson-Ballagh Corporation	6
Petroleum Electric Power Club	96-97
Petroleum Rectifying Co.	87
Pittsburgh Equitable Meter Co.	Front Cover
Pomona Pump Co.	117
Prest-O-Lite Company, Inc., The	19
Rector Well Equipment Co.	
Reed Roller Bit Co.	27
Republic Steel Corporation	80
Shaffer Tool Works	1
Smith, A. O., Corp.	68-69
Smith, E. M., Co.	107
South Chester Tube Co.	75
Sperry-Sun Well Surveying Co.	119
Stevens Asbestos Products Corp.	113
Texas State Hotel	118
Tretolite Company	Inside Front Cover
Trimont Manufacturing Co.	39
Trinity Portland Cement Co.	5
Tulsa Winch Mfg. Co.	64
Union Carbide & Carbon Corporation	19
Union Carbide Sales Co.	19
Union Wire Rope Corporation	
U. S. Steel Corporation Subsidiaries	10, 99, 100 and 101
United Supply & Mfg. Co.	116
Vernon Tool Co., Ltd.	
Waukesha Motor Co.	111
Williamsport Wire Rope Co.	72
Witte Engine Works	115
Wyatt Metal & Boiler Works	
Young Engine Corp.	113
Youngstown Sheet & Tube Co.	51

CUT DOWN YOUR ROUND-TRIP TIME

● The faster you make the round-trips the faster you get to "pay."

TRU-LAY Preformed rotary lines help you cut down the unproductive time of making a round-trip. It speeds up this time-consuming operation because TRU-LAY Preformed is a faster line. It is faster because it is more flexible—refuses to whip—spools on the drum better.

In many other ways TRU-LAY Preformed saves time. It is easier to handle—resists kinking—can be strung quicker.

Specify TRU-LAY Preformed—in the Improved Plow Steel grade. You will know it by the emerald strand.

GREEN SIGNIFIES SAFETY

AMERICAN CABLE COMPANY, Inc.
Wilkes-Barre, Pennsylvania
An Associate Company of the American Chain Company, Inc.
IN BUSINESS FOR YOUR SAFETY
Branches or Distributors in all Oil Field centers

TRU-LAY *Preformed* Rotary Lines

ALL AMERICAN CABLE COMPANY LINES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE EMERALD STRAND

HOWCO TESTER

10 YEARS OF SUCCESS

Ten years of successful use in all fields, under every imaginable condition, and at depths down to 9,768 feet . . . . ten powerful reasons why the HOWCO Tester is today the ACCEPTED method of testing the productivity of formations without setting casing. Types to meet all conditions.

HALLIBURTON OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA . . . CALIFORNIA OFFICE: 810 SOUTH SPRING STREET, LOS ANGELES